University of Alberta

Assessing the Consumer Acceptance and Market Potential of Alberta Bison Meat

by

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Abstract

The purpose of this study is to improve our understanding of consumer perceptions towards bison meat. Focus group discussions and a web-based survey were implemented to study consumers' attitudes and purchasing decisions for bison meat in Alberta. Multinomial logit models were developed to estimate the impact of bison meat attributes and socio-economic and demographic characteristics on Alberta consumers' choice behavior.

The results suggest that price, fat content, GMO labeling and labeling of farm origin traceability are significant attributes that impact consumers' choices on meat purchasing. Interactions between bison steak attributes and selected socio-economic variables, and between alternative-specific constants and socio-economic variables indicate that selected socio-economic and demographic variables have a significant influence on consumers' choices. However, certain consumer segments perceive attributes such as farm origin traceability and GMO labeling differently. Further, for the meat attributes specified in this study, health conscious consumers were found to be more likely to choose bison than beef.

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Chapter 1: Introduction

1.1 Background

Alternative livestock refers to livestock species such as bison, deer, elk etc. other than cattle, hogs, or chickens. Other common terms for these species are diversified or specialized livestock. The interest in producing alternative livestock has increased since the 1980's, as these species provide diversification opportunities with potential high-profit for Canadian farmers. High-value breeding stock, lower maintenance costs, increasing demand for "exotic" and "healthful" meats and growing export markets for specialty meat products are major factors for the growth of this industry (Statistics Canada, 2002).

As Canadians' tastes in food change, their appetite for more exotic meats is growing. Health conscious consumers with increasing disposable incomes seek alternative livestock products for their novelty or advertised health benefits (Statistics Canada, 2002). Therefore, consumers seeking low-fat, low-cholesterol and low-calorie alternatives to beef or pork are finding that these meats fit their demand. According to Health Canada (1999), for example, a 100 grams serving of bison meat has 2 grams of fat compared with an average of 6 grams for beef, 5 grams for pork and 3 grams for chicken. More restaurants are including elk, and bison on their menus. In Alberta, for instance, bison steaks and burgers have made their regular presence to supermarkets' shelves and restaurants' menu. 13 of 40 restaurants surveyed in Canada purchased a total 356 kilogram of venison weekly (Rock and Reynolds-Zayak, 2001).

Although many alternative species are becoming established in Alberta and in other provinces in Canada, a great many are still developing, facing the challenge of gaining market share and long-run viability. This indicates that in general some initial markets may be ephemeral, and the alternative livestock industry is an emerging industry rather than a mature industry in Canadian agriculture.

There are opportunities and challenges for alternative livestock industry. An example is the elk industry, which has been fueled by Asian demand for velvet antlers. However, with an apparently weakening economic situation in the Asian markets in 1998, primarily due to the Asian financial crisis, there was a market downturn of 30 to 50%, therefore some elk producers were looking for an alternative market (Serecon, 2001). Another example is from ostrich industry, whose breeding stock market with high demand for birds and eggs in the initial stages of the industry have tapered off in recent years, the number of animals on farm declined dramatically by 2001. In Alberta, the number of ostrich on farm declined by 65%, and the decrease was 56% across Canada, from 1996 to 2001 (Statistics Canada, 2002). Ostrich producers are now searching for a final product market at a steady volume and price.

On the other hand, bison and elk are two more established species comparing to other alternative livestock species on Canadian farms, which are not only driven by the breeding stock markets, but also, to some extent, by consumer demand for end products – bison meat and elk meat products. They are strategically important both in Alberta and in Canada (Statistics Canada, 2002; Agriculture and Agri-Food Canada, 2005).

1.2 Research Purpose

As interest in producing alternative livestock has increased in recent years, a number of new, alternative meats have been introduced into the supermarket meat case, specialized meat shops and gourmet restaurant menu, which include bison, elk, goat, wild boar, ostrich, and emu (Oliver-Lyons, 1998). However, information on alternative meat markets and studies are very limited. To support the sustainable growth and development of a market-driven alternative livestock industry in Alberta, a better understanding of consumers' preferences for alternative meat is crucial. How do consumers perceive these meats – are they perceived as "exotic"? If so, might the exotic label discourage consumers from purchasing them? What attributes do consumers look for in alternative meats? Answers to these questions are important to support sustainable growth and development of a market-driven alternative livestock industry in Alberta.

The overall purpose of our research is to improve the understanding of consumer perceptions towards the consumption of bison. More specifically, the objectives are to:

1) study the attitude and purchasing choices for bison.
2) analyze the effects of socio-economic factors of Alberta consumers in purchasing bison.
3) explore possibilities for market segmentation and marketing implications.

1.3 Methods of Analysis

To achieve these objectives, this study has taken the following steps:

1) A preliminary survey questionnaire was developed, and feedback was received from animal scientists, nutritionists, and marketing representatives.
2) This preliminary survey was revised by discussion with four focus groups from Alberta consumers.
3) A web-based survey was constructed, in which attribute-based choice experiments were employed. Beef was the status quo choice for each survey participant. As consumers indicate their willingness or unwillingness to switch away from beef and towards bison, the research is focused on several key policy-relevant issues: how important are information sources in consumers' purchasing decisions of alternative meats? What role does origin traceability play in consumers' choice? To what extent do consumers care about Genetically Modified Organisms (GMO) in producing those meats? How might respondents' socio-economic and demographic characteristics influence their choices?

1.4 Organization of the Thesis

This thesis is organized as follows. Chapter 1 has provided background information and introduced the nature of the problem. Chapter 2 provides an overview of the alternative meat industry. Chapter 3 is the literature review of previous studies on alternative meats.

Chapter 4 discusses the methodological approaches for the research, including review of random utility theory and discrete choice models. Chapter 5 explains the survey design, data collection and descriptive analysis of the survey data. Chapter 6 presents the estimation procedure of the multinomial logit models and the model results. Chapter 7 summarizes the important findings of the study and the marketing implications for the bison industry. It also discusses the limitation of the study and recommendation for further research. The Appendices include descriptive statistics of the data, tables, figures and model results.

Chapter 2: Industry Overview

2.1 Introduction

The main objective of this chapter is to discuss the background of the bison industry and the alternative livestock industry in general, and to evaluate the opportunities and challenges for marketing alternative meat products. The bison survey is the focus for this thesis. However, the survey that was conducted also involved an analysis of consumers' preferences of other alternative meats. Therefore the industry overview is not limited to the bison industry.

2.2 The Size and Trend of the Alternative Meat Industry

In western Canada, there is a better chance of seeing bison, deer, elk, llama and wild boar on a farm than elsewhere in Canada. These species are called alternative livestock species in this study. Alternative livestock refers to livestock species such as bison, deer, elk etc. other than cattle, hogs, or chickens (Negrave, 1999). Other common terms for these species are diversified or specialized livestock.

Alternative red meat products are included in Canada's red meat and meat products industry, which includes beef, pork and lamb. With annual shipments worth $14.6 billion in 2002, the red meat industry is the largest sector of the Canadian food manufacturing industry (Agriculture and Agri-Food Canada, 2005). In 2002, the red meat industry placed fourth among Canada's leading manufacturing industries. In 2003, the traditional beef and hog sectors realized about one-fourth of total farm cash receipts: farm cash receipts from the sale of cattle and calves in 2003 totaled $5.2 billion, 15% of total farm receipts, while farm cash receipts from the sale of slaughter hogs in 2003 were $3.4 billion, 10% of total farm receipts. In 2004, there were 14.7 million cattle and calves on approximately 120,000 farms with 39% of the inventory in Alberta, and there were 4.6 million hogs on 13,665 farms. In 2004, 997,000 sheep and lambs were on approximately

13,232 farms. 70% of Canadian sheep production is located in Alberta, Ontario and Quebec. Farm cash receipts for sheep and lamb in 2003 totaled $97.7 million. However, it is only about 0.3% of the total farm receipts (Ross, 2005).

Canadian farms have always supported a variety of livestock beyond the traditional cattle, hog, sheep and poultry. Livestock producers began to explore alternative or nontraditional species as a means of diversifying farm income and utilizing marginal agricultural land since 1980's. During the 1990's many of these species expanded rapidly, driving breeding stock values upwards. In 2001, this growth trend was continuing for some species, yet population numbers have leveled, or in some cases declined for other species (Statistics Canada, 2002). Most consistent in their growth have been bison and elk, indigenous species well adapted to the climate that fit in well with current livestock operations, as well as llamas and alpacas. In 2004, there were 162,000 cervids on about 2,000 Canadian farms. Elk are primarily farmed in the west and red deer in the eastern provinces. Fallow deer, white-tailed deer and other deer species are found throughout Canada where provincial legislation permits. There were 230,000 bison on about 1,900 farms in Canada. Bison production is primarily concentrated in the west at 85-90% (Ross, 2005).

Other species such as ostrich and emus experienced substantial growth in their numbers between 1991 and 1996, but declined substantially by 2001. Goat numbers continue to show good growth since 1986 in response to the demand for goat milk and meat. Most striking increase in 2001 has been the increase in ducks on farms, with the rise of 74% from 1996 to 2001, mostly occurring in Ontario and Quebec (Statistics Canada, 2002). Since 1980's the interest in producing alternative livestock has increased, as these species have provided diversification opportunities with potential high-profit for Canadian farmers. High-value breeding stock, lower maintenance costs, increasing demand for healthful meats, and growing export markets for specialty products were hypothesized as the main incentives for the growth of this industry (Sanderson and Hobbs, 2001).

2.3. The Development of Bison Industry

Bison are native to the prairie and parkland regions of Western Canada (Negrave, 1999). Commercial bison production has expanded, and experienced tremendous growth since the 1990's with a 25% annual increase in Canada (Rutley, 2003). The Canadian bison herd reached its size of 145,094 head by the year 2001, from the size of 15,775 in 1991, and 45,437 in 1996; the increase of herd size was about 219% at the period of 1996 to 2001. The number of ranch operations also expanded rapidly, growing from less than 285 in 1991, to more than 1,800 operations in 2001. In Alberta, the expansion has been even greater, with a 250% increase of bison herd size and a 184% increase of bison farms at the period of 1996 to 2001 (Agriculture and Agri-Food Canada, 2005). The Canadian Bison Association (CBA, 2005) estimates that there were more than 230,000 bison on about 1900 farms as of December of 2004, representing an annual compound growth rate of about 20% since 1996. Based on Statistics Canada's Agriculture Census, the CBA also estimates that there were between 270,000 and 290,000 bison on Canadian farms in 2005.

Table 2.2 presents the number of slaughtered bison in Canada from 1996 to 2005, indicating that slaughter capacity and activity are increasing steadily, especially in western Canada. According to the CBA and Agriculture and Agri-Food Canada (2005), bison slaughtered at federally and provincially certified plants has increased by about 30% annually since 2001. In 2005, a total of 30,000 bison were slaughtered in federal and provincial slaughter plants of which over 80% has been slaughtered in federal plants in recent years.

However, despite these growth prospects, there are also marketing challenges for the bison industry, which are perhaps typical of a dynamic emerging industry that undergoes rapid expansion in supply potential with much slower development of consumer demand for end product. The breeding stock market has been the primary driver for investment in the Canadian bison industry. Existing producers and newly entered producers were expanding bison herd size and speculating the highly profitable prices for breeding animals would continue. Premium prices for breeding stock were evident at the years of

1996, 1997 and 1998, but have been significantly discounted since 2000. Meat prices have also been discounted in an effort to develop new markets (Sanderson and Hobbs, 2001).

According to Nixdorf (2003), average bison stock prices from various public auction sales in Canada from 1986 to 1990's reflected rising prices, and maintained the highest price levels during late 1990's (1996 -1998). However, this sustained price rise ended in 1999 with a sharp price decline in 2000 and a further decline in 2001. For instance, average prices of one-year-old heifers and bulls were at the industry peak in 1996, but decreased dramatically in 2000, representing about 60 percent and 62 percent decline in prices respectively. The prices for mature breeding cows were highest in 1997, but the price declined in 2000 by nearly 60 percent (Figure 2.1).

Resulting from the high price in the peak years, the breeding stock market has led to a strong incentive for farmers in increasing bison herd size. Figure 2.2 shows that the inventories in Canada increased steadily from 1990 to 2002, but started to decline in 2003; when it peaked in 2002, the prices at pubic auction sales for bison had already sharply dropped by more than 80% from the highest prices.

At the same time, consumer demand for bison meat has slowly developed, it is reported that bison meat sales are mostly through the hotel and restaurant trade, specialty meat stores, and farm gate sales (Oliver-Lyons, 1998; Full Course Strategies Inc., 2004). Hobbs et al. (2000 and 2001) suggest that bison meat products are not price competitive with beef at the retail level without the success of economies of scale for bison processors. Therefore, it has been challenging to increase market share for bison meat cuts as consumer demand was yet unknown and undeveloped, and since the mainstream demand for red meat is focused on traditional red meat such as beef.

With the large inventory of bison in Canada, it is important to determine where bison has consumer demand potential so as to sustain price premiums, and how it is positioned relative to other red meats.

2.4. The Development of Elk Industry

Elk or wapiti (*Cervus elaphus*) are a member of the deer family (*Cervidae*) which includes deer, moose and reindeer. The most common species of cervidae on game farms is Wapiti. Elk, because of their large size, are preferred for velvet antler production. Mature elk stags can produce at least 15 kilograms (33 pounds) of velvet annually. Commercial elk production in Alberta involves the controlled breeding and raising of elk for the production and sale of elk meat, velvet antler, breeding stock and trophy bulls. Distribution of farmed elk in Canada is determined by the provincial laws and regulations established to control this industry. Alberta makes up about 50% of the total Canadian elk herd (Statistics Canada, 2002; Nixdorf, 2003). Primary markets for elk producers are for venison (elk meat), velvet antler, breeding stock, and trophy bulls. Specialized markets also exist for elk by-products such as hard antlers, hides, antler buttons, and ivories (Thorleifson, Pearse and Friedel, 2000).

Canada's elk industry followed a similar expansion path to the bison industry. In 1991, there were only 9,091 head on 206 farms across Canada; in 1996, the number of elk reached 19,024 with 110 percent increase, whereas 443 farms ranching elk were reported with 115 percent increase at the period of 1991 to 1996. The trend continued from 1996 to 2001, there were 74,478 elk on 1,172 farms, increasing by 291 percent and 165 percent respectively in the five years (Statistics Canada, 2002).

The growth of elk industry was driven by strong demand and escalating prices for breading stock at the initial stage (Figure 2.3). From 1986 to 1998, prices continued to climb with some temporary downturn in 1993 and 1994 and reached highest in 1997; compared to 1986 public auction prices of elk in Canada, the average auction prices increased tremendously by more than 340 percent. However, the highly profitable prices were unable to sustain, and dropped dramatically since 1998, and further declined onward; in 2001, prices had decreased by 80 to 90 percent comparing to 1997 auction prices (Nixdorf, 2003).

On the other hand, high demand for breeding stock and velvet producing bulls limited elk meat production both in Alberta and elsewhere in Canada. Largely due to the high price for breeding stock and velvet antler production, Canadian market for elk meat is poorly developed. Comparing the large inventory of elk across Canadian farms, the number of slaughtered elk was very few before 1997, but slaughter increased steadily since 2000 and according to Agriculture and Agri-Food Canada (2005), in 2004, the number of slaughtered elk were 6,900 heads, which was more than 320 percent increase since 2002.

This trend suggests that the decline in breeding stock prices has turned the focus of the industry to venison production. Currently, venison is most commonly marketed through farm direct marketing or specialty retail outlets. Also, venison is marketed as gourmet fare meat, primarily through up-market hotels and restaurants (Thorleifson, Pearse and Friedel, 2000; Oliver-Lyons, 1998).

Deer farming industries have been established in many countries around the world. Several species are raised, varying with the climate and target markets. Populations are shown in the table *World Populations of Farmed Elk and Deer*, 1999 (Table 2.3). Consumer markets for venison are well developed in EU countries, Russia and China. New Zealand is a major player in the world venison market, exporting 80% (12,932,084 kg in 2002) of its venison production to European markets; New Zealand supplies approximately 80% of United States venison (1,124,557 kg in 2002) as well as exporting an estimated 144,839 kg into Alberta each year (Alberta Elk Commission, 2005).

2.5 Goat and Other Alternative Livestock

The number of goats on Canadian farms continues to show good growth since 1986 in response to the demand for goat milk and meat, with the increases of 16 percent, 43 percent and 45 percent across Canada from 1986 to 1991, from 1991 to 1996 and from 1996 to 2001 respectively (Statistics Canada, 2002). The 1991 Canadian goat population reported by Statistics Canada was 88,116 head. The reported population of Western provinces was Alberta 15,656; Saskatchewan, 8,511 and Manitoba, 9,172. In 2001, there were 182,851 heads, while there were 42,270 in Alberta, 15,797 in Saskatchewan, and 12,637 in Manitoba (Statistics Canada, 2002).

The increased supply of goat meat is largely driven by the increase in ethnic demand due to immigration. The consumer demand for goat meat is essentially new immigrants from the goat-consuming regions of the world, which includes the Mediterranean, Southern Europe, the Middle East, Africa, Southeastern Asia, South America, Central America and the West Indies (Alberta Agriculture, Food and Rural Development, 2006).

According to Alberta Agriculture, Food and Rural Development (AAFRD, 2006), the ethnic demand for goat meat is expected to remain steady even in the event of increasing prices for the following reasons:

i) Ethnic households tend to have a higher proportion of wage earners compared to other consumer groups.

ii) Immigrants are used to paying a greater portion of their discretionary income for food.

As a growing industry, the non-ethnic market for goat meat has not been developed nor has it been tested to determine its potential in Alberta (AAFRD, 2006). Two potential niche markets for goat meat would be the market serving lean-conscious meat consumers and restaurants that feature ethnic foods as a gourmet food (AAFRD, 2006). Formal distribution channels to support these markets are beginning to emerge. As a result, factors such as standard carcass sizes are evolving. Tradex (1994) surveyed the meat goat producers in western Canada, and concluded that 62% of meat goat sales were made at the farm gate with the remainder made through auction markets. 25% of the farm gate sales or 16% of all meat goat sales were made directly to consumers (Tradex International Consulting Corp., 1994).

Canadian goat meat sector is also facing international competition from Australia and New Zealand, which produce goat meat with lower cost comparing to Canadian producers. The availability of imported, low-priced frozen goat meat is likely to place a price ceiling on the price of goat meat in Canada; however Canadian producers provide fresh meat from young animals to consumers, and have the potential to charge a premium price (AAFRD, 2006).

Like other alternative livestock species with market potentials, the wild boar industry also has grown significantly. The national herd was seven times larger in 2001 than in 1991; Alberta reported an increase in 422% of the number of wild boars from 1991 to 1996, and a continuous 79% increase from 1996 to 2001 (Statistics Canada, 2002). Demand for lean, nutritious and tasty wild boar meat comes from the ethnic and novelty markets, and from health conscious consumers. Hunters are also interested in wild boar farms for sport and recreation (Negrave, 1999; Sudom, Nixdorf, Lipinski and Dobbs, 2001).

2.6. Sheep and Lamb Industry

The sheep industry has been predominately domestic oriented, supplying approximately 50 percent of the Canadian market. As of January 1, 2002 Canada's sheep and lambs inventories totaled 801,100 heads, a 4.4 percent decrease over 1998. Canada's sheep population is located primarily in Ontario, Quebec and Alberta (Saskatchewan Agriculture and Food, 2002).

The sheep industry is different from other traditional livestock sectors. It not only reported increases in animal numbers and in average flock size, but also in the number of farms reporting. According to Statistics Canada (2003), farmers reported almost 1.3 million sheep and lambs in 2001, a 46% increase since 1996, but still well below the 3.6 million reported in 1931. Meat has replaced wool as the primary product, and an increasingly diverse population whose diet regularly includes lamb is driving the resurgence of the industry. Ontario has taken over from Alberta as the province with the most sheep. Ontario had 338,000 sheep in 2001, 46% more than in 1996. Manitoba and Saskatchewan both doubled their inventories since 1996. While sheep numbers in

Canada are split almost equally between the East and the West, both Ontario and Quebec have increased their share of the total since 1996 (Statistics Canada, 2003).

Sheep have played an important role in the development of Alberta's agricultural industry. There are approximately 2,500 Alberta sheep producers and 167,000 sheep. According to the Alberta "Flock Benchmark Survey"(2000), the average flock size is 102 ewes, 29 ewe lambs, 4 mature rams and 2 ram lambs. When large commercial flocks were excluded, the average flock would be 65 ewes with 20 ewe lambs, 3 mature rams and 1 ram lamb (AAFRD, 2002). However, according to State of the Ontario Sheep Industry Report (2004), significant decrease in flock size occurred in Alberta, partly due to the drought conditions in 2002 and the United States border closure to live animals in 2003. Alberta's breeding flock size dropped by 8.6 percent, while breeding flock size increased in Saskatchewan by 3.6 percent; in Manitoba by 8.3 percent and in British Columbia by 7 percent.

The Canadian sheep industry has initiated an on-farm quality assurance program and an identification and trace back program to ensure the health and safety of products. The Canadian Sheep Identification Program will address producer concerns about sheep health and meet consumer expectations for quality assurance and food safety. The mandatory Canadian Sheep Identification Program began on January 1st, 2004. These industry-led initiatives are important to the development and protection of the sheep industry and to capture export markets (Canadian Food Inspection Agency; Canadian Sheep Federation, 2005).

2.7 Evaluating the Challenges of Bison and Other Alternative Livestock Species

Bison and other alternative livestock share some of the same characteristics and face similar challenges.Viable industry expansion is dependent upon the enhanced supply chain infrastructure, consistent meat supply with assured meat product quality, and sustainable consumer markets for alternative meats (Hobbs et al., 2006).

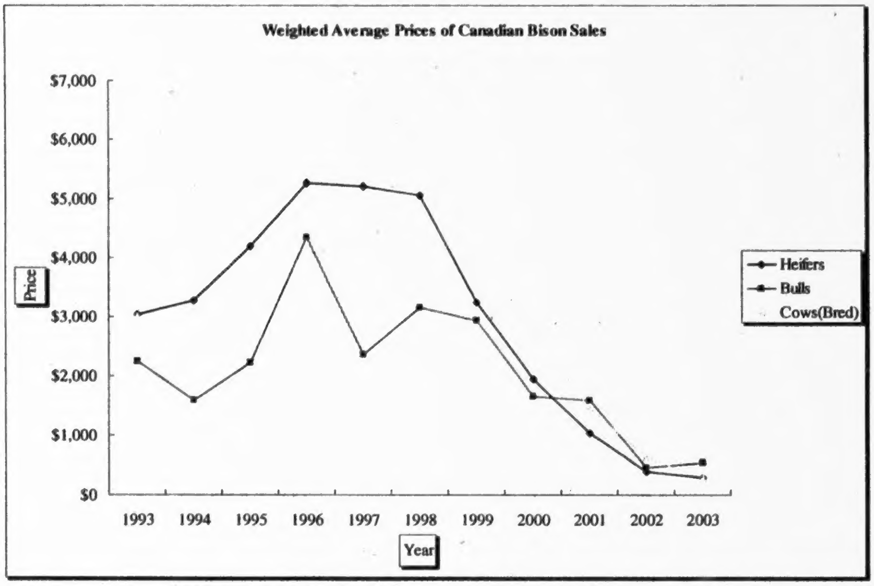
The immediate challenges for the producers are how to introduce their products to the retail market successfully, or to expand the market of an existing agricultural product. Promotion of a new product is especially difficult for relatively small and developing industries which do not command the resources necessary to launch large-scale advertising campaigns (Gillespie and Schupp, 2002). Prices are likely to be high in the initial stage of growth of the industry; however, these high prices are unlikely to sustain (Sanderson and Hobbs, 2001). It is perhaps ascribed that producers are inconsistent with the productivity and supply of meat products; marketing efforts are placed on breeding stock or intermediate products rather than increasing consumers' demand for the meat products (Gillespie et al., 2002; Hobbs et al., 2006).

Therefore, the industry may need to devote resources early on to developing a primary demand, i.e. the final products for consumer demand for the species, if it is to sustain the growth in the long run. A common practice in 1990's, however, was to develop the demand for inputs, breeding stocks in this case, that was not based upon primary consumer demand. When the primary demand for the product has not been expanded and production and inventories were increased, high prices collapsed (Gillespie et al. 2002; Turvey and Sparling, 2002). In sum, it is highly desirable to evaluate consumers' acceptance and perceptions of various alternative meats and meat products.

2.8 Chapter Summary

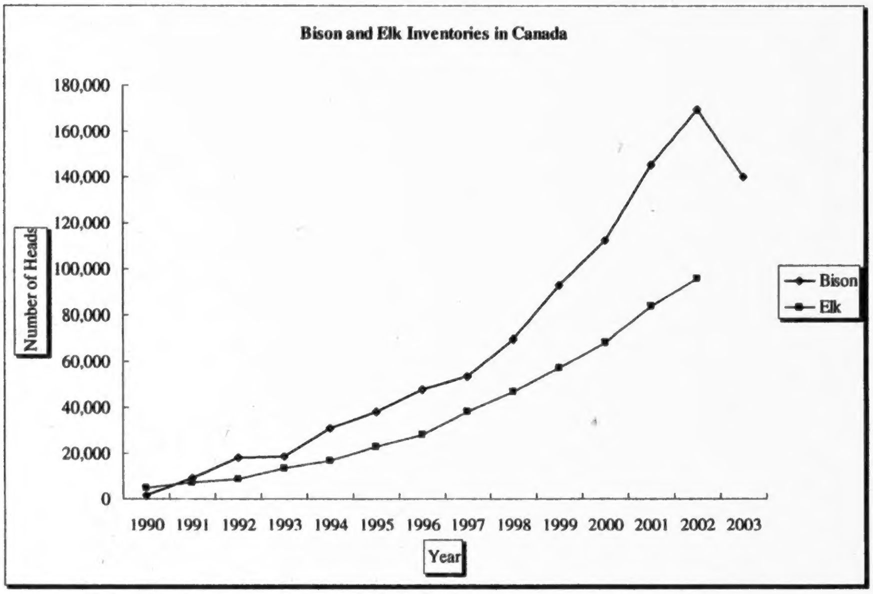
This chapter has presented background information to bison and other species in the alternative livestock industry. It has discussed some of the opportunities and challenges which the industry is facing. Given the limited information on alternative meat markets and studies, a better understanding of consumer perceptions preferences towards bison and other alternative meats is desirable in order to support the sustainable growth and development of a market-driven alternative meat industry in Alberta.

Figure 2.1 Weighted Average Prices of Canadian Bison Sales[1]



Source: Nixdorf (2003), Specialized Livestock Inventory and Prices Update

Figure 2.2 Bison and Elk Inventories in Canada



Source: Nixdorf (2003), Specialized Livestock Inventory and Prices Update

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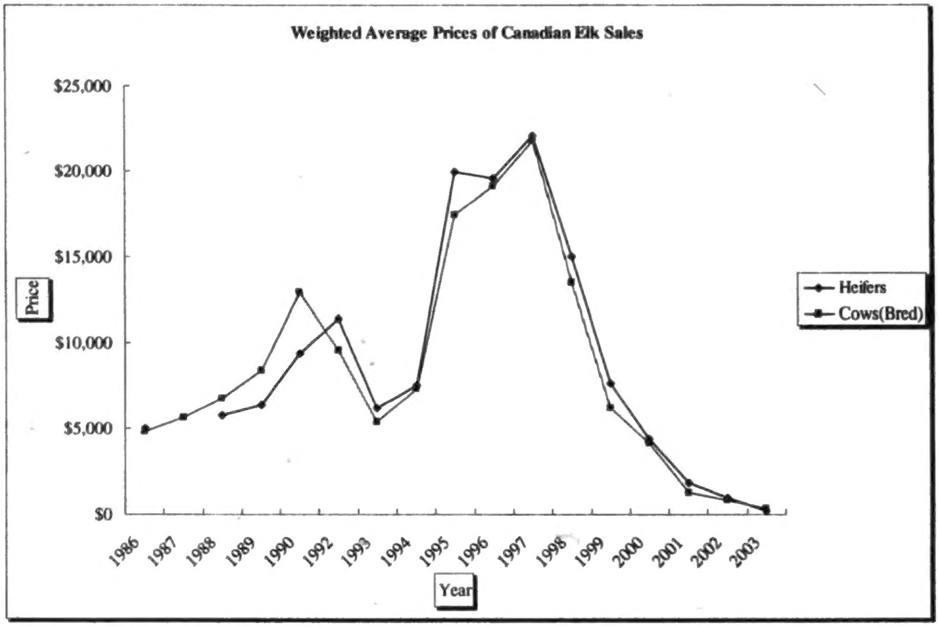
[1] The weighted average price of bison is the average price from various pubic auctions from across Canada, which does not account for sales entry fee or commissions (Nixdorf 2003).

Figure 2.3 Weighted Average Prices of Canadian Elk Sales[2]



Source: Nixdorf (2003), Specialized Livestock Inventory and Prices Update

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[2] The weighted average price of elk is the average price from various pubic auctions from across Canada, which does not account for sales entry fee or commissions (Nixdorf 2003).

Table 2.1 Estimated Inventories of Bison and Elk in Canada (Number of Heard)

Year	Bison	Elk
1990	1,200	4,610
1991	9,100	7,254
1992	18,087	8,701
1993	18,750	13,476
1994	30,927	16,726
1995	37,921	22,897
1996	47,621	28,256
1997	53,254	37,994
1998	69,334	46,791
1999	92,628	57,238
2000	112,515	68,093
2001	144,860	83,908
2002	169,500	95,925
2003	140,000	-

Source: Agriculture and Agri-Food Canada (2005)

Table 2.2 Bison Slaughter in Federal and Provincial Plants (Number of Head)

Year	East	West	Total Slaughter
1996	178	1,588	1,766
1997	177	1,799	1,976
1998	212	2,642	2,854
1999	260	4,671	4,931
2000	296	6,059	6,355
2001	390	10,769	11,159
2002	651	16,928	17579
2003	1,332	22,151	23,483
2004	1,724	26,552	28,276
2005	2,100	27,900	30,000

Source: Agriculture and Agri-Food Canada (2005)

Table 2.3 World Populations of Farmed Elk and Deer 1999

Country	Number	Predominant Breeds	Uses	Velvet Antler (tonnes, green)
New Zealand	1,400,000	Red deer, elk, fallow deer	venison, antler	450
China	1,000,000	Red deer, elk, sika	antler	200
Russia	400,000	Elk, red deer, sika	venison, antler	180
United States	250,000	Elk, red deer, fallow & others	venison, antler	50
Australia	180,000	Elk, red deer, rusa, fallow	venison, antler	10
Germany	150,000	Red and fallow deer	venison	-
Korea	112,000	Elk, red deer, sika	antler	40
Canada	115,000	Elk, reds, fallow and whitetails	venison, antler	52
Mauritius	60,000	Rusa deer	venison	45
England	50,000	Red and fallow deer	venison	-
Eire(Ireland)	38,000	Red deer	venison	-
Scotland	20,000	Red deer	venison	-
Taiwan	36,000	Sika, sambar, red deer	antler	
Sweden	35,000	Red and fallow	venison	15
Denmark	30,000	Red and fallow	venison	-
France	30,000	Red and fallow	venison	-
New Caledonia	20,000	Rusa	venison, antler	
Vietnam	15,000	Sika deer	antler	1
Malaysia	15,000	Red, fallow and Rusa	venison, antler	5
Thailand	5,000	Sambar and red deer	venison, antler	5
Norway	1,000	Red deer	venison	2
Totals	**3,915,000**			**898**

Source: Thorleifson, Ian Pearse and Friedel. Elk Farming Handbook (2000)

Chapter 3: Literature Review of Meat Studies

3.1 Introduction

The following review focuses on marketing studies for alternative red meats. Apart from a review of the literature on alternative meats, which includes bison, venison, ostrich, deer, and wild boar etc., this review also includes branded traditional meats, as well as fish and seafood. These studies were included as they provide marketing insights into consumer perceptions and preferences towards new meat products in general.

3.2 Alternative Meats Studies

Earlier studies on alternative meats (McLean-Meyinsse et al., 1995; Schupp et al., 1998; Gillespie et al., 1998) focus on identifying the influence of socioeconomic and demographic variables on consumer purchasing decisions. More recent studies (Hobbs et al., 2003, 2006; Nelson and Liu, 2005) explore the contribution of meat attributes in explaining consumers' purchasing behaviour and perceptions.

McLean-Meyinsse, Hui and Meyinsse (1995) examine the extent to which socioeconomic characteristics are associated with consumers' decisions to purchase new specialty meat products: quail, alligator, and deer meat. Chi-square contingency tests are used to show whether there are significant differences in respondents' consumption patterns due to socioeconomic characteristics. The results from this consumer survey of households in Louisiana and Texas suggest that socio-economic factors influence consumption decisions on consuming quail, alligator, or deer meat. The consumption of, or interest in, consuming new food products in general varies significantly with martial status, age, education,. household size and income, ethnic background, religion, and occupation. The same socio-economic characteristics are found to be statistically significant in consumption decisions on quail and alligator meat, except for marital status and household size. Ethnic background and occupation influence the consumption of deer meat.

Torok, Tatsch, Bradley, Mittelstaedt, and May (1998) report the identification of American consumer characteristic dimensions and marketing strategies for restaurants selling bison meat. Bison taste tests and surveys are performed to collect demographic, psychographic, taste preference, intention to purchase, and product characteristic or attribute data. Based on a nonparametric estimation approach, the authors identify four characteristic dimensions of customers. These are variety meat eater, game meat eater, health conscious consumers and celebrators of special occasions. The results from Torok et al. (1998) suggest that those who prefer bison to beef and those who intend to purchase bison in the future have eaten a variety of other meats recently, indicating that potential bison consumers seek out different types of meats, and that bison retailers should position bison as a complementary meat product, rather than a competitive meat product. Therefore, the authors argue that bison should be positioned on restaurant menus as a variety meat, not as a direct substitute for beef. However, other researchers have found conflicting evidence and suggest to position bison as a direct substitute, which will be explained in the following paragraphs (Hobbs et al. 2003 and 2006; Gillespie and Schupp 2002).

Torok et al. (1998) also find that there is a characteristic dimension of potential bison consumers to be game meat eaters, suggesting that some consumers would be attracted to bison's non-domesticated attribute, so that the untamed aspects should be stressed in marketing strategy. The authors conclude that since potential bison consumers eat healthier and leaner meats, the health benefits of bison should be stressed when positioning bison against other fatter meats. This is in line with the authors' conclusion that chicken, fish, and turkey are likely to be substitutes and competitors of bison meat. Their results also suggest that some consumers seem willing to consider bison as a special occasion food, especially in restaurant, which could offer an opportunity to market more expensive cuts of bison as special occasion meats. Further, the authors suggest that many potential consumers of bison products can be attracted by two or more of these dimensions. In order to have consumers to pay a price premium, bison products promotion should thus emphasize the above attributes jointly with the juiciness, taste and appearance of bison.

Torok et al. (1998) also point out limitations of their study, which include the short time period, specific location, and small sample size that are common to the analysis of survey data. The small sample size and the use of nonparametric statistical techniques may not reveal the true characteristics of the population. However, the research results, which are based on primary data, provide important information related to the marketing of bison in restaurants in the United States.

Schupp, Gillespie and Reed (1998) investigate consumer choice among alternative red meats in Louisiana, U.S. A multinomial logit model is applied to analyze consumer choice between the best retail meat cut from four species of alternative livestock or "none of these" with equal retail prices. The data source is from a 1997 survey of Louisiana households, which included bison, emu, ostrich, and venison. The important variables in the respondent's selection among the species of alternative livestock are: gender, age, education and race of the respondent; previous consumption of meat from exotic animals; and respondent identification of venison as an exotic meat. The respondents indicate some resistance to consuming meat from animals that they consider as exotic. The results suggest that producers and sellers of meat from exotic animals would have to overcome these perceptions to move their product beyond niche markets. The authors also indicate that their sample is somewhat biased toward the white, higher-educated, or higher-income portions of the Louisiana population. This is typical of unstructured mail surveys.

In retrospect, Schupp et al. (1998) perceive that the analysis can be strengthened and enhanced if two additional items of information are obtained from the respondents. The first one is whether the household contains a recreational hunter, because households obtaining and consuming wild meat are likely to perceive meat from the four alternative species differently than those households that do not. The second one is whether there are vegetarians in the respondent's household. Households with one or more vegetarians are likely to have less experience with meats of all kinds, whether traditional or alternative meats. Therefore the authors conclude that future alternative meat research should include these two variables to estimate their influence on the exotic issue. These two issues have been accommodated in our research efforts (see later chapters).

In a restaurant and retail study, Gillespie, Taylor, Schupp and Wirth (1998) examine professional buyers' attitudes towards ostrich in the United States, by analyzing current and past use and knowledge of ostrich meat by restaurants and retailers. The authors estimate buyer ratings of potential ostrich meat products from most to least preferred, as well as the relative importance of a selected group of attributes of ostrich meats. Mail surveys and a conjoint analysis are employed to fulfill these objectives. The most preferred ostrich meat products for the retail and restaurant sectors are estimated by Two-limit Tobit models, as well as the relative importance of attributes considered in the decision to purchase ostrich meat. The results suggest that buyers have very limited knowledge of ostrich meat, that the preferred product in both the restaurant and retail markets is a branded, 6-oz. ostrich filet at the lowest price, and that price is not the most important factor determining retail and restaurant managers' decisions on the product. The study further suggests that the expansion of ostrich meat (and also other alternative meats) into larger market rather than small niche markets would require lowering of price, increasing promotion at the handler level, higher levels of quality assurance, and more attention to meat cuts that consumers demand. The authors argue that ostrich meat is a substitute of beef, which fits into the category of a low-fat, low-cholesterol, and low-calorie red meat. Much like bison, venison, and rabbit, it is being sold primarily as a niche market product. Therefore, the authors suggest that the overall findings of this study would, to a limited degree, also be beneficial to other alternative red meats.

In another ostrich study, Gillespie and Schupp (2002) analyze the evolution of the United States ostrich industry from the mid-1980s to 2002. An econometric model is developed to examine ostrich pricing over the period 1993 – 1999, offering an overview of the U.S. ostrich industry. An Ordinary Least Squares (OLS) regression model is applied to examine ostrich pricing over the period 1993-1999. Results suggest that the prices decrease over the observation time. At the very early stage of this industry, prices of ostrich breeding stock were extremely high, but in 1995-1996 prices fell drastically and many firms discontinued production. The authors argue that this scenario can be explained by the theory of the evolution of new industries, and that it is an example for other alternative agricultural industries. The authors also stress that as a beef substitute, ostrich meat is considered as a healthy red meat attracting the health-conscious and upper-income consumers. However, insufficient effort is made to promote ostrich meat, in particular compared with traditional meats and other alternative meats like bison, venison, and goat. The authors further suggest that if the industry is to become viable in the long run, it must devote resources early on to developing a primary (consumer) demand for the product; leaders in new industries like the alternative livestock industry will need to promote the final product to consumers, while merely developing the demand for inputs (breeding stock in this case) will not sustain the growth in the long run.

Taylor, Andrews, Gillespie, Schupp and Prinyawiwatkul (1998) compare emu and ostrich meats with beef to identify and quantify their sensory attributes. A sensory panel is used to compare U.S. Department of Agriculture Choice top sirloin beef with emu and ostrich meat, both ground and intact meat. Comparisons of sensory quality and acceptability are made after zero, two, four and six months of frozen storage. Differences in flavor, juiciness and texture are detected between ratite meals and beef (the control). The differences are more pronounced for intact cuts than for ground meat, with ratite meat is rated inferior to beef. Some differences in sensory acceptability were revealed across the six-month storage period.

McLean-Meyinesse (2003) investigates consumers' willingness to try a variety of goat meat products. Data come from a random sample of 1,421 telephone surveys in 13 states in the United States. This paper examines goat demand by assessing previous consumption and interest in consuming goat meat, as well as other value-added goat meat products. Selected demographic, socioeconomic and geographic (DSG) factors are assessed to estimate their influence on previous consumption, willingness to consume goat meat, and interest in buying goat nuggets, patties, roasts, or marinated ready-to-cook and packaged goat meat. Binomial logit and ordered probit models are used to test the relationship between prior goat meat consumption and DSG characteristics. The most likely consumers of goat nuggets, patties, roasts, or marinated ready-to-cook and packaged goat meat are from households with three or more persons, Catholics, non-Caucasians, males, or Texas residents.

Nelson and Liu (2005) look into the empirical evidence of demand potential for goat meat in the US. Based on a random sampling procedure, a telephone survey was conducted in 2004, in which 2751 households were interviewed in eleven Southern states. The data permit the examination of goat meat demand by different ethnic populations, as well as the diversity among the states surveyed. Five econometric models are used to examine the goat meat demand: current demand, demand increase from per capita consumption, demand increase from new consumers, and demand changes related to season and occasions. The study identifies the major factors influencing goat meat purchasing in a large set of socioeconomic and demographic variables. The analysis differs from others in its large data base and the quantitative assessment of multi-layer demand. The authors suggest that there exists substantial demand for goat meat and a potential increase in the demand. The authors conclude that the projected increase in demand of goat meat is driven by the existing customers' willingness to purchase more and the potential entry of new consumers into the market. Multiple factors influence the current demand for goat meat and its potential of increase. Ethnic background, age, real income, and the consumption of other meat products are a few of such factors, and the major driving force of goat meat consumption goes to the ethnic population. They argue that the continuous growth of immigrants is likely to drive the expansion of goat meat demand in the short run. Age is another notable factor, as the elderly are likely to consume more goat meat. The authors further predict that the demand potential for goat meat is expected to be at record high, when more "baby-boomers" retire in the coming years; however, in a short term goat meat consumption is still seasonal and occasional, and in the long run, goat meat can have a competitive share on the meat market if convenient goat meat products suitable for daily consumption are further developed.

Stefanson and Associates (1998) study the marketing of wild boar in western Canada. Initiated by the Western Canadian Wild Boar Association, the goal of this project is to establish an organized marketing tool for their industry, and to increase returns to producers through the capture of higher margins generated in the processing and distribution of Wild Boar products. The problems within the distribution chain, barriers to the development of the industry are identified to improve the organizational structure. After investigating potential markets and the activities that are currently taking place, the study concludes that the distribution chain is currently working well, although segments must be developed in order for the industry to grow in a sustainable manner. The findings suggest that the appropriate organizational structure for industry development is a new generation co-operative. It is suggested that this co-operative must increase its market power and potential through strategic alliances and co-operation with other players in the industry.

To identify the characteristics that consumers value in bison and to distinguish consumer segments with different preferences, Hobbs, Sanderson and Cunningham's studies (2001, 2003 and 2006) focus on the understanding of consumers' perception of quality. The authors explore which attributes influence the purchase and consumption decision, so that product development and marketing strategies can be developed.

Sanderson and Hobbs (2001) study Canadian consumers' perceptions of bison meat. Consumer taste panels were conducted in Alberta, Canada, in order to identify consumers' evaluation for specific bison meat attributes through a Vickrey's second price auction. The pilot study reveals that three categories of attributes - palatability, health and economic attributes – are important to the consumer's red meat purchase and consumption decision. Price, tenderness, fat content and convenience to cook are four of the most important attributes for bison meat buyers. The authors suggest that consumers are willing to pay more for improved tenderness, lower preparation time and reduced fat content. The study concludes that the bison industry has large market opportunities by using product differentiation and product development strategies. In addition, the results suggest that consumers have inaccurate perceptions about bison. For example, almost 40 percent of respondents did not disagree with the false statement that bison are an endangered species. Therefore, it is necessary for the bison industry to build on positive images and to correct misperceptions about bison through future promotional strategies.

Cunningham (2003) examines the impact of three different information treatments on consumers' willingness-to-pay for bison. The three treatments are a nutritional comparison chart of negatively-perceived nutrients, a bison taste testimonial from a restaurant chef, and a statement concerning the absence of growth hormones and antibiotics in processed bison. The hypothesis test is that nutritional information about bison would elicit the greatest increase in willingness-to-pay for the processed bison product. A random *n*th-price auction was conducted in December 2002 in Guelph, Ontario, with 57 participants to elicit willingness-to-pay values for the processed bison product. A regression model is used where socio-demographics serve as independent variables, and the difference in bids as the dependent variable. The results suggest that nutritional information is insignificant. Therefore the hypothesis that nutritional information about bison would elicit the greatest increase in WTP for the processed bison product is rejected. Nevertheless, each information treatment is found to increase the group mean willingness-to-pay. Therefore the author concludes that any information relevant to consumers about bison may be beneficial in increasing market share for bison products. He also suggests that industry participants may need to work together to simultaneously increase awareness, distribution and consumption of bison products to ensure the sustainability of the bison industry.

Hobbs et al. (2003 and 2006) evaluate Canadian consumer attitudes towards bison; in particular, they assess consumer preferences and WTP for six value-added products: bison burger, kebab, stew, deli meat, bison garlic sausage and marinated bison strips. Consumer panels were undertaken through 2002 and early 2003 in five Canadian locations in Saskatchewan, Alberta, British Columbia, Ontario and Québec. The study shows that consumers have limited knowledge about bison; hence, almost any type of information would be beneficial in increasing awareness of bison products. The authors suggest that it is beneficial to increase awareness of bison being ranch-raised all over North America, and to promote the fact that bison are not an endangered species. The authors argue that bison is considered to be quite similar to beef in taste and appearance, which are important attributes in the decision to purchase and consume a meat product and will therefore have a significant influence on the marketing of bison meat products. On the other hand, consumers' perceptions about the similarity of meat products change, as the specific attributes of price, healthiness and the eating occasions or locations vary. This finding offers the industry an opportunity to target marketing towards those consumer segments that value these attributes so that bison meat can be differentiated from beef and other traditional meat products. The results of the experimental auction suggest that there are specific groups of individuals who value bison for its lower fat content and natural production methods, as well as for the novel eating experience it offers. An analysis of competitiveness suggests that the similarity of meat cuts is important to consumers. They suggest that this is an important consideration when choosing products to develop and market to specific consumer segments. The results also indicate that bison producers should assure is the consistent quality of bison to meet consumers' expectations or perceptions for that product. The study performs a cluster analysis based on respondents' rating of the importance of price and a number of health, convenience and image attributes. Three of the five consumer segments are identified to prioritize specific health attributes when purchasing meat. One group emphasizes the importance of looking for a unique/novel eating experience and the appeal of a meat product native to North America; another group values convenience. Therefore, the authors suggest that the key to developing a successful marketing plan is to identify target market segments that are interested in the unique attributes of bison meat.

Hobbs et al. (2003 and 2006) also use experimental auctions to gather more information about willingness-to-pay for bison products. An ordinary least squares (OLS) regression model is run using average bids for the last five rounds of a sandwich auction as the dependent variable. Only the last five rounds were used under the assumption that learning may occur in first few rounds of bidding; hence these later bids are therefore considered to be more stable in revealing willingness-to-pay (Shogren et al., 1994;

Hayes et al., 1995; Dickinson and Bailey, 2003). Independent variables included the average market price of the first five rounds of bidding, respondent gender, age, education level, income level, the number of times the person had tried bison, and their overall rating of the deli meat product in the taste test. There was a wide distribution of bids among consumers, including a large number (27.6%) of zero bids for the sandwich with bison only. This indicates that many consumers are indifferent between bison and beef unless the bison meat offered them something extra. These results suggest the need to emphasize and develop the "extra" benefits of bison in order to command a premium in the marketplace. Other factors that are significant in influencing people's bids include gender, whether they had previously tried bison, and how much they liked the bison deli meat in the sensory evaluation. Consumers in BC bid significantly lower than those elsewhere. Overall, willingness-to-pay is statistically higher for two of the bison sandwiches – the sandwich labeled as produced without hormones and the sandwich labeled as 60% lower in fat and produced without the use of growth hormones.

3.3 Other New Food Products

Marketing studies on other new food products are also included in this literature review, as they are also related to the changing pattern of consumer preferences for alternative meats. Such a review is also useful to document the advantages and disadvantages of a variety of methodological approaches used in related industry contexts.

The literature on branded and naturally raised traditional meats provides a valuable reference for marketing insights into alternative meats. Grannis and Thilmany (2002) examine the potential market for natural pork in the U.S. market. Their research identifies market segments for a natural, regionally produced line of pork products, to assist Colorado producers in developing a viable marketing plan. A contingent valuation mail survey was conducted. A two-stage probit model is employed to estimate target market segments. The results suggest that high-income pork consumers, frequent pork consumers, and those consumers who have purchased natural beef before, are most likely to purchase natural pork products. Two target markets are identified, based on consumer concerns about feed additives, and consumer concerns about the effects of pork production on the environment. The study is limited by the assumption that the market segments are distinct and discontinuous; this assumption is not tested. Therefore, the authors suggest that a follow-up study should estimate these markets using an ordered bivariate process, such as an ordered probit or logit model.

Unterschultz, Quagrainie, Veeman, and Kim (1998) conduct a study on South Korean perceptions towards Canadian beef, US. beef and Australian beef, using a stated preference choice experiment methodology in 1995. Executive chefs and purchasing managers from major 4-star and 5-star hotels were interviewed. Korean professional buyers strongly prefer beef from the US with quality similar to US prime, and they prefer lower price and high-grade beef products. For a comparable high quality beef product from Canada or the US, the model predicts that there is a 28% chance of the aggregate group choosing Canadian beef, versus a 49% chance of this same group choosing US beef. The authors suggest that the Canadian beef industry needs to make aggressive marketing efforts to address the issue of price and grade as well as positive Canadian beef image in Korea, so that Canadian beef can compete with US beef and Australian beef effectively.

Quagrainie, Unterschultz, and Veeman (1998) use stated preference methods to assess western Canadian consumers' preferences towards the identification of origin of fresh meat products and bio-preservatives in meat packaging. A nested logit model is used to analyze data from survey responses. The possible presence of consumer market segments interested in high-quality beef, high-quality pork, and ground beef from Alberta origin are examined. Empirical results suggest that western Canadian consumers are loyal to meat products from Alberta and Canada as a whole, comparing to the U.S. fresh meat products, and products without any origin labeling. The results of a simulation suggest that the price of a beef cut identified to be labeled Canada origin must be reduced by 15% before western Canadian consumers will be indifferent between Canada origin and Alberta origin. The authors conclude that these findings indicate a positive Alberta beef image, and that using Alberta beef industry as a trade mark can be a possible marketing strategy to distinguish Alberta beef in the western Canadian market.

Kuperis, Veeman and Adamowicz (1999) examine Edmonton consumers' choices to the use of rBST (recombinant somatotrophin) in milk production under a hypothetical market situation. The survey data is analyzed by a conditional logit model with product attributes and selected socio-economic and demographic variables. This study also examines the trade-offs that consumers are willing to make between the four milk attributes: fat content, price, freshness and rBST. Welfare gains and losses for a representative household food purchaser are also calculated. The authors conclude that welfare losses are higher for a female than for a male food purchaser, and for consumers with lower income and education; a representative consumer will gain more welfare by offering him a full range of "rBST" and "non-rBST" milks. Therefore, making appropriately labeled "rBST-free" milk available to consumers will decrease consumer welfare losses if rBST is introduced to Canada.

Nauman, Gempesaw, Bacon, and Manalo (1995) study consumer choice for fresh fish. The objective of their study is to analyze the relationship between consumers' experiences, perceptions, preferences, and the ultimate choice to purchase selected fish products. A consumer survey was conducted in the northeastern United States to gather market information regarding the decision to purchase fresh hybrid striped bass, trout and salmon. A modified "evoked set framework" along with logit models is used to model the experience, perceptions, preferences, and choices of consumers for seafood products. The evoked set is the set of possible products or brands that consumers may be considering in the decision process. It is the set of choices that has been evoked and is salient as compared with the larger number of available possible choices. Choice, which is the end decision for the purchase of a particular product, is assumed to be explained by experience, perception, and preference along with the socioeconomic and demographic variables.

Özayan et al. (1998) analyze buyers' preference for new food products (minced meat) derived from Louisiana's undersized crawfish. Results from focus groups indicate that a potential market for the crawfish mince meat is seafood restaurants, where the mince can be utilized as ingredients for various menu items. Conjoint analysis shows that the strongest attribute effects for both products are associated with the product's form, with the highest preferences being a fresh, never frozen product. On the other hand, the least preferred form is a dehydrated bouillon product. The authors also discuss the market's desire for base and stuffing products that are priced well below the price of crawfish tail meat.

3.4 Chapter Summary

This chapter reviews marketing studies for alternative red meats, literature on branded traditional meats, as well as fish and seafood. This review contains marketing insights into consumer perceptions and preferences towards new meat products in general, and alternative meat products in particular. From the above studies, we conclude that consumers' socioeconomic characteristics appear to influence consumer's choice behaviour significantly.

As market and sales data usually are not available for new food products, stated preference survey (McLean-Meyinsse et al., 1995; Schupp et al., 1998; Gillespie et al., 1998; Nelson and Liu, 2005) and hypothetical market auctions (Hobbs et al., 2001, 2003 and 2006) were most widely used to investigate consumer preferences. The choice experiment approach has been applied in beef marketing studies (Unterschultz et al., 1998; Quagrainie et al., 1998). However, to the best of our knowledge no previous research on alternative red meats has been conducted, using attribute-based choice experiments to access consumer preferences.

Chapter 4: Methodology

4.1 Introduction

This chapter outlines the economic theory that underlies this study. The chapter consists of three sections. Section 4.2 introduces the theoretical fundamental of discrete choice modeling, random utility theory. Section 4.3 presents the framework of the multinomial logit model (MNL), and section 4.4 presents the application of the MNL model in this study.

4.2 Discrete Choice and Random Utility Model

Consumers' choice decisions between alternative meats (steaks) represent a discrete choice situation, where the classic linear estimation method of ordinary least squares is unsuitable. As Ben-Akiva and Lerman (1985 p.3) point out, "The basic problem confronted by discrete choice analysis is the modeling of choice from a set of mutually exclusive and collectively exhaustive alternatives."

The theoretical fundamental of this research is based on the random utility maximization (RUM) theory. The random utility model assumes that individuals evaluate each alternative in terms of utility or benefit, and will choose the alternative which yields highest utility. As consumer's utility is derived from an alternative's characteristics or attributes (Lancaster, 1966, 1971), the random utility model states that a consumer *i*, receives utility, U_{ij}, from choosing a choice alternative *j* from a finite set of choices, *C*. The individual's utility of choice is equal to $U_{ij} = U(X_{ij}, S_i)$, where X_{ij} is a vector of specific attributes of alternative *j* as experienced by individual *i*, and S_i is a vector of socio-economic and demographic characteristics, such as attitudes, perceptions and demographics (Ben-Akiva and Lerman, 1985).

Following this body of theory, the utility of an alternative is viewed as a function of the attributes of the alternative and relevant socio-economic and demographic characteristics of a decision maker, such as age, gender, income and education. For a consumer *i* to choose *j*=1, 2, ..., *J* alternatives, the utility function of alternative *j* is typically represented as follows:

$$U_{ij} = V_{ij} + \varepsilon_{ij} \tag{4.1}$$

where U_{ij} is the utility of alternative *j* for individual *i*; V_{ij} is the indirect utility function, a systematic component or observable utility contributed by attributes of the alternative *j*; ε_{ij} is a random component which is the unobservable part of the total utility for the alternative *j*. V_{ij} can be expanded to be a linear function of *n* attributes for a specific alternative. This can be represented by,

$$V_j = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + ... + \beta_n X_n \tag{4.2}$$

where each X represents one of the *n* attributes associated with alternative *j*, and each β represents a parameter or "taste weight".

Also, it is expected that an alternative *j* will be chosen over another alternative *k*, if the utility associated with *j* is greater than utility from alternative *k*. The key assumption is that a consumer *i* will select the alternative *j* over alternative *k*, given $j, k \in C$ where *C* is the set of alternatives:

$$U_{ij} > U_{ik} \text{ for all } j \neq k \tag{4.3}$$

Therefore, equation 4.3 can be rewritten as:

$$V_{ij} + \varepsilon_{ij} > V_{ik} + \varepsilon_{ik} \tag{4.4}$$

Rearranging the indirect functions and random errors yields:

$$V_{ij} - V_{ik} > \varepsilon_{ik} - \varepsilon_{ij} \tag{4.5}$$

However, in practice it is difficult to observe $(\varepsilon_{ik} - \varepsilon_{ij})$, and one can not determine whether $V_{ij} - V_{ik} > \varepsilon_{ik} - \varepsilon_{ij}$. Therefore, we calculate the probability that ($V_{ij} - V_{ik}$) will be greater than ($\varepsilon_{ik} - \varepsilon_{ij}$) (Louviere, Hensher and Swait, 2000). This leads to the following equation:

$$Prob\,(j) = Prob\,(V_{ij} - V_{ik} > \varepsilon_{ik} - \varepsilon_{ij}) \qquad \forall\, j \neq k \qquad (4.6)$$

As the probability that an alternative is chosen is defined as the probability that it has the greatest utility among the available alternatives, the true utilities of the alternatives are considered random variables. Therefore, an empirical model should consist of a parameterized utility function in terms of observable independent variables and unknown parameters, where their values are estimated from a sample of observed choice, made by decision makers when confronted with a choice situation (Ben-Akiva and Lerman, 1985 p.3).

4.3 The Multinomial Logit (MNL) Model

Following the theory of Random Utility Model and Lancaster's consumer demand theory, an individual's indirect utility function is viewed to be represented by systematic and random components. The individual selects the alternative that maximizes his or her utility. However, which alternative is chosen depends on both the systematic or observable components of the utilities, and the values of the error terms associated with these utilities for that individual. McFadden (1974 and 1986) develops an econometric model that combines random utility maximization and discrete choice analysis, which is called multinomial logit (conditional logit) model. He outlines a general procedure for formulating econometric models of population choice behavior from distributions of individual decision rules. These models are derived by assuming that the random error terms follows an extreme value Type I (Weibull) distribution, and they are independently and identically distributed across alternatives (Mc Fadden 1974).

Independent variables in the multinomial logit model fall into two categories. One type of independent variables are invariant to response categories: demographic variables such as one's age, ethnic background and gender; socioeconomic variables such as education, income, and occupation. Another type of independent variables are choice specific, taking on different values/levels dependent on the response category (Liao, 1994). Therefore, in empirical applications, it is useful to distinguish the two categories of observable factors in the indirect utility function V_{ij} (Ben-Akiva and Lerman, 1985). As from the above, we assume that utility $U_{ij} = U(X_{ij}, S_i)$, where X_{ij} is a vector of specific attributes of alternative *j* as experienced by individual *i*, S_i is a vector of socio-economic and demographic characteristics, β is a vector of coefficients for these attributes, and α_j are vectors of coefficients of the individual-specific characteristics for individual *i*, so that:

$$V_{ij} = \beta X_{ij} + \alpha_i S_i + \varepsilon_{ij} \qquad (4.7)$$

Hence, the probability of choosing a specific alternative *j* depends on the attributes of the specific meat relative to the attributes of other alternatives in the choice set. Assuming an exteme value Type I distribution for the error terms, the probability of choosing alternative *j* for individual *i* takes the form of a multinomial logit model (Mc Fadden 1974):

$$prob(Y_i = j) = \frac{\exp(\mu V_{ij})}{\sum_{j=1}^{J} \exp(\mu V_{ij})} \quad \text{for all } j \in C \qquad (4.8)$$

where Y_i is the dependent variable that indicates the choice on alternative *j*; *C* is the set of alternatives; V_{ij} is the indirect utility function which is conditional on choice (its linear expression of attributes and taste parameters is shown in equation 4.2); μ is a scale parameter which is typically normalized to one (Louviere et al., 2000; Boxall, Murray and Unterschultz, 2003). The parameter vector β' can be estimated using maximum likelihood techniques. Equation 4.8 is the general formula of the MNL model.

To emphasize, there are two important assumptions in the use of multinomial logit models. One issue is the assumption of independence form irrelevant alternatives or IIA. The IIA property holds that the ratio of the choice probabilities of any two alternatives for a particular observation is not systematically influenced by any other alternatives in the choice set (Ben-Akiva and Lerman, 1985; Train, 1986; Greene, 1990). The other key assumption is that the random terms are assumed to be independently and identically distributed (IID) as Weibull density functions, or Type I distribution, as McFadden (1974) shows.

4.4 Application of the Multinomial Logit Model in This Study

To examine consumers' choice for bison, a web-based survey was designed. In the choice experiment of the bison survey, consumers were faced with three alternatives and four attributes, so that the specific utility function of each meat alternative, U_{ij} can be represented as:

$$U_{ij} = \beta_0 + \beta_{i1}X_{i1} + \beta_{i2}X_{i2} + \beta_{i3}X_{i3} + \ldots + \beta_{in}X_{in} + \varepsilon_{ij} \qquad (4.9)$$

where $j = 1, 2, 3$; $n = 1, 2, 3, 4$ (which take different values depending on the underlying attribute); and β_0 is a constant for the utility function, which is called the alternative-specific constant (Hensher et al. 2000).

Since we are interested in exploring how socioeconomic and demographic characteristics influence consumers' choice for bison meat, the utility function can be extended by adding vector S_i, which is a vector of socio-economic and demographic characteristics for a survey respondent *i*, so that the MNL model includes both choice-specific attributes, and individual-specific characteristics:[3]

$$prob(Y_i = j) = \frac{\exp(\beta' X_{ik} + \alpha' S_i)}{\sum_{j=1}^{J} \exp(\beta' X_{ij} + \alpha' S_i)} \quad j = 1, 2, 3 \qquad (4.10)$$

A potential issue in the empirical estimation is that socioeconomic and demographic variables are individual specific. Therefore, these variables cannot be examined directly in a multinomial logit (conditional logit) model, because they do not vary across alternatives. According equations 4.5 and 4.7, the individual specific variables cancel out of the utility difference. In order to obtain insight into consumers' heterogeneous demand, we can interact socioeconomic and demographic variables with alternative-specific attributes, to provide identification of attribute parameter differences in response to a change in individual factors (Louviere et al. 2000; Holmes and Adamowicz 2003). For example, interacting age with the price attribute would generate information on the marginal utility of price as a function of age.

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[3] The details and analysis of the survey will be presented in Chapter 5 and Chapter 6.

Another issue is the use of alternative-specific constants (ASCs) in the econometric specification. As ASCs identify the utility of the alternatives which are not accounted for by the attributes of these alternative stated in the attribute-based choice experiment, it is necessary to use ASCs to capture respondents' utility independent of the attribute levels (Holmes and Adamowicz 2003). The choice experiment in the web-based survey includes both meat alternatives and an "opt-out" option. Therefore, it is also important to generate an ASC for the opt-out situation to model the alternative's utility. Since there are $j = 3$ alternatives in the choice set, $(j - 1) = 2$ ASCs are included in the empirical modeling.

4.5 Chapter Summary

This chapter has presented the random utility framework and the multinomial logit model which are used in the empirical part of this study. The econometric specification in the following chapters will be based on the methodology; two potential issues: interaction effects and ASCs are discussed in this chapter.

Chapter 5: Survey Development and Descriptive Analysis of the Survey Data

5.1 Introduction

This chapter documents the use of focus groups as part of the development of our web-based survey. It then presents the descriptive statistics and frequency distribution of the responses from our web-based survey.

5.2. Alternative Meats Focus Groups

To ensure the appropriateness of the alternative meats survey instrument used in this study, we conducted four focus groups between May and June 2005, at a central facility at the University of Alberta in Edmonton. Each group consisted of seven to ten participants. The first two focus groups were comprised of students from the University of Alberta; they were recruited by the research team from a student's association mailing list. The survey instrument was then revised and scrutinized by the two following focus groups. The participants for these latter two groups were recruited out of the general Alberta population by a professional marketing company, using random digital dialing. Exclusion criteria for these last two focus groups were age (under 18) and vegetarianism. A major effort was made to recruit both urban and rural consumers in proportion to the actual population split in Alberta.

The main objectives of these focus group discussions were (i) to identify the meat attributes relevant for consumers' choice decision; (ii) to obtain an understanding of the contentious issues around the consumption of alternative meats, especially bison, venison and lamb; and (iii) to test and modify a preliminary questionnaire. Informal discussions and flipcharts were used first to identify the most relevant attributes and attribute levels, and related consumer perceptions. Moreover, we used selected preliminary questions from each of the three parts that make up the final survey: the first part asks several questions related to meat attributes and consumption habits; the second part consists of a choice experiment in which consumers are presented with various steak options. The third part focuses on demographic variables and past purchases.

Table 5.1 is an example of the product features that were discussed. Only those features were included in the survey which received significant attention by focus group participants. This information was instrumental in the design of the choice experiment format.

The following sections present the results from all four focus group discussions for bison. In those cases, where the questions were expanded to all three species, the results are reported. The description of the following attributes (e.g. "tenderness and flavour") reflects the outcome from the focus group discussion.

1. Tenderness and Flavour

52.6% of the focus group participants indicated that it is a very important attribute for bison meat, and 42.1% claimed it is extremely important; in total, 94.7% of the respondents thought it is an important attribute.

2. Meat Colour

21% of participants indicated that colour is somewhat important in choosing bison ; 57.9% thought it as very important; 10.5% thought it was extremely important.

3. Freshness:

36.8% indicated that freshness is somewhat important, 36.8% said it is very important, and 10.5% said that freshness is extremely important respectively; 15.8% of participants believe it is not very important.

4. Price

For 26% of focus group participants, price was very important in their bison choice; 42.1% felt it is important; only 26.3% indicated that it is somewhat important.

5. Importance of Variety of Cuts

Out of all focus group participants, 52.6% feel that variety is very important; 15.8% said that it is extremely important, while 21.1% indicated that it is somewhat important.

6. Absence of Growth Hormones, Antibiotics and Animal Protein in Raising Animals

Nearly 80% of participants were concerned with the use of growth hormones and antibiotics in meat production across. The absence of growth hormones, antibiotics and animal protein in raising animals is somewhat important to 31.6%, very important to 10.5% and extremely important to 36.8% of participants considering their choice of bison meat.

7. Origin Certification on Packaging

For 26.3% of the focus group participants, this attribute is somewhat important, for another 26.3% it was very important, and for 15.8% of participants origin certification was extremely important.

8. Low Cholesterol and Fat

47.4% of participants claimed that low cholesterol and fat are extremely important (respondents also felt that cholesterol and fat could be treated in one attribute category); to 15.8% of participants it is a very important attribute combination, and to 21.1% it is somewhat important.

9. Animals Raised Humanely

Animal welfare is an emerging issue for consumers, which is reflected in the fact that 42.1% of focus group participants suggested that it is very important, and 31.6% indicated that it is extremely important in their choice of bison meat; however, consumers were also concerned with the credence nature of this attribute: how would a consumer know if the animal was raised humanely? Hence, the issue of labeling and certification was discussed jointly with this issue. We used also this information as justification to include origin certification explicitly in the final survey design.

10. Information Sources Affecting Consumer Behaviour

Table 5.2 was used for discussions during the focus group sessions. It turned out that newspapers, magazines and internet sources do not significantly affect participants' decision of buying alternative meats: for bison, over 50% of participants disagree that these information sources are important; TV and radio were considered to be somewhat more effective, as 50% of participants indicated that it is somewhat important. Nevertheless, friends, and family members' opinions were considered to be very important or extremely important (together 60%). Health professionals' advice was also considered to be a very important source for focus group participants, as 50% think it is very important, and 10% said it would be extremely important.

We also discussed how frequently and where consumers bought the above meats. Given the diverse channels through which alternative meats can be purchased, our focus group discussions tried to capture all relevant sources, including hunting and private distribution. For all focus group participants, almost 50% had never bought bison meat, 63% had never bought lamb, and 79% had never purchased elk meat before. Interestingly, 58% never ate certified organic meats, 10.5% buy bison directly from a farm, and 21% got elk meat from a friend who hunts. As to be expected, respondents found it difficult to distinguish between venison, deer meat and elk meat. In order to improve the reliability of the final survey, we chose to focus on one species, elk, rather than to try and lump elk and deer into one group, as it would remain unknown whether consumers would be able to distinguish between these two meats. A similar issue relates to bison: over 30% of the focus group participants thought that bison and buffalo do not refer to the same species. Therefore, the final web survey included a statement saying that bison and buffalo refer to the same specie.

5.3 The Web-based Bison Survey

5.3.1 Introduction

The web-based survey was designed by Dr. Steiner (2005) in the Department of Rural Economy at the University of Alberta. The survey consists of three parts: The first part of the survey asked the respondents to state their preferences with regards to their current or past purchasing pattern, as well as their attitudes towards bison meat attributes.

However, the questions were not limited to bison meat; the respondents were also asked a few questions about their perceptions and purchases on venison and lamb.

The second part of the survey consisted of repeated choice experiments. Respondents faced four choice sets, in each of which they could choose one of three options: a beef steak, a bison steak, or neither of the previous two alternatives. This choice experiment was preceded by a question that asks respondents to specify their regular beef steak purchase in terms of price, fat level, a label of farm origin traceability and a label which states that bison was guaranteed produced without genetically modified organisms. Once a respondent has entered this information, it becomes his or her status quo in the following four choice experiment questions, and this choice automatically re-appears in each web page of the choice experiment.

The third part of the survey was designed to collect the respondents' socio-economic and demographic information. This information is linked with consumers' stated preferences from the first and second part of the survey to distinguish particular consumer segments and target markets. Following an initial telephone screening, in which consumers were asked whether they would be willing to participate and receive a $5 Amazon voucher, 289 respondents agreed to answer the web-based bison survey. Out of those 289 respondents, 210 completed the choice experiment (CE) questions. Therefore, not all of the 210 individuals who finished the CE questions also completed the other questions. The following descriptive analysis and the estimation results presented in this thesis are based on the 210 observations.

Tables 5.3.1, 5.3.2, and 5.3.3 show that a majority of respondents (76.7%) agree or strongly agree that "bison is an alternative meat". There are about 52.4% of the respondents who agree or strongly agree that "bison is a wild meat". On the other hand, there are just 43.8% of the respondents agree or strongly agree that bison is an exotic meat.

Although this survey is focused on consumers' perceptions towards bison, for comparison and further research, there are also questions designed for consumers' perceptions towards elk. Tables 5.3.4, 5.3.5, and 5.3.6 show that 84.8% of the respondents agree or strongly agree that elk is a wild meat, followed by 67.6% of respondents who think that elk is an alternative meat, and 47.6% of respondents who agree or strongly agree that elk is an exotic meat. Figure 5.3.1 and Figure 5.3.2 suggest that there are more respondents who consider elk as a wild meat than an alternative meat or exotic meat, compared with bison.

These statistics indicate that bison industry has successfully promoted and defined the bison meat using the term "alternative meat", as a majority of respondents accept that bison meat is a type of alternative meat. On the other hand, over fifty percent of people also agree that bison is a wild meat, suggesting that consumers have different perceptions of bison from those of beef, chicken or other traditional meats.

However, our focus group studies also suggest that respondents usually obtained venison from hunting or from friends who hunt deer or elk, which may explain why over eighty percent of people consider venison as "wild" meat (in the initial focus groups, we used the term "venison", which was later replaced by "elk").

5.3.2 Meat Attributes

To obtain respondents' perceptions of meat attributes, they were asked to rate eleven bison meat attributes in this survey on a 5-point scale, where 1 indicates the most important and 5 indicates the least important. The eleven meat attributes are ranked from the most important attribute to the least important attribute as follows (Tables 5.4.1 and 5.4.2):

91.4% of the respondents rated that "tenderness and flavour" is the most important or very important meat attribute; 67.1% of respondents think that "no use of growth hormones, antibiotics, and animal protein in raising the animals" is very important or the most important attribute; price takes the third place as 65.2% of the respondents rated it as the most important or very important attribute; 60% of them believe that "low cholesterol and fat" are very important or the most important; "trace-back certification on packaging (origin)" takes the fifth place (58.1%), and "absence of genetic modification (non-GM)" is the sixth important attribute (55.2%).

Similarly, "handling and cooking recommendations on packaging" and "meat colour" are both the seventh important attributes; "trying something different" is in the eights place by 41.4% of the rating; "raised locally", and "seasoned and ready-to-cook meat" are rated as the last two least important attributes with 38.1% and 21.4% of rating respectively.

5.3.4 Reasons Not to Buy Bison

In order to access the current challenges and marketing limitations for the bison industry, we stated five main reasons why respondents might not purchase bison meat. The relative importance for each reason is scaled from 1, the most important, to 5, the least important.

Figure 5.5 shows that "Lack of availability" is the most important reason rated by the respondent, followed by "Lack of promotion and advertising", "Lack of cooking / preparation experience", "In-store packaging unappealing", and "Disease-related issues".

Table 5.5.1 to Table 5.5.6 present the statistics for each stated reason:

A. Lack of promotion and advertising

26.67% of the respondents think it is the most important reason why they do not purchase bison meat; 23.38% of the respondents think it is a very important reason that they do not purchase bison meat. In total there are 49.05% of the respondents who believe it is a very important or the most important reason for them not to purchase bison meat.

B. Lack of availability

39.05% of the respondents think it is the most important reason that they do not purchase bison meat; 29.52% of the respondents think it is a very important reason that they do not purchase bison meat. In total 68.57% of the respondents believe that it is a very important or the most important reason for them not to purchase bison meat.

C. Lack of cooking / preparation experience

23.33% of the respondents think it is the most important reason that they do not purchase bison meat; 21.90% of the respondents think it is a very important reason that they do not purchase bison meat. In total there are about 45.24% of the respondents who believe it is a very important or the most important reason for them not to purchase bison meat.

D. In-store packaging unappealing

15.24% of the respondents think it is the most important reason that they do not purchase bison meat; 10.48% of the respondents think it is a very important reason that they do not purchase bison meat. In total 25.71% of the respondents believe that it is a very important or the most important reason for them not to purchase bison meat.

E. Disease-related issues

30.48% of the respondents think it is the most important reason that they do not purchase bison meat; 8.10% of the respondents think it is a very important reason that they do not purchase bison meat. In total 38.57% of the respondents believe that it is a very important or the most important reason for them not to purchase bison meat.

The descriptive statistics reveal that "lack of availability" is the most important reason that consumers do not to buy bison, indicating that supply limitation is the first concern for Alberta bison industry and maybe for alternative meat industry in general. "Lack of promotion and advertising" is at the second place of the important reasons, which may address the demand limitation due to the high price premium of bison meat. "Lack of cooking / preparation experience" is the third important reason stated in this question. It seems that the cooking guide of bison meat needs to be included if bison industry is going to launch advertising and promotions. "Disease-related issues" and "in–store packaging unappealing" are the fourth and fifth important reasons accordingly, which are not considered as important as the other three reasons by the respondents.

5.3.5 The Consumption of Organic Food

The respondents were asked about the frequency of consuming organic food, including both vegetable and meat in the past four weeks. Figure 5.6 shows that 28.1% of the respondents never purchase organic food, while 13.33% were unsure if they bought organic food; on the other hand, nearly 58.6% said that they have had organic produce at least once in the last four weeks, which includes 20.48% of sample purchasing once or twice, 21.43% for 3 to 5 times, and 16.67% for more than 5 times in the past four weeks.

5.3.6 Meals at Home

Respondents were asked how many times per week they have meals cooked at home. Table 5.7 shows that the range of times eating at home is from zero to 21 times. Cumulative percentage suggest that 35.24% of the respondents eat no more than 7 meals per week; there are 32.38% of the respondents who eat no more than 14 meals per week; and there are 30.48% of the respondents eat no more than 21 meals at home, however, only 7.6% of the respondents or 16 out of 210 persons said they have all their 3 meals every day at home (Table 5.7 and Figure 5.7).

Consumers who have meals at home frequently, between 15 times and 21 times, account for 30.48% of the sample. In other words, nearly 70% of the respondents eat out rather often, which suggests that marketing opportunities in restaurants should be further explored for bison.

5. 3.7 Methods of Cooking

Respondents were asked how they prepare their meals at home and what kind of food items they use for cooking. Table 5.8 indicates that respondents will prepare and cook meals at home form the following three categories on average:

A) 55.5% of the meals are prepared from scratch using food basics like meat, potatoes, pasta, vegetables, and, or fruit;
B) 18.6% of the meals are made using prepared / ready-to-eat foods like frozen dinners, food items cooked at stores or delis, canned soups or pasta;
C) 25.8% of the meals are cooked by a mixture of items cooked from scratch and pre-prepared food items.

5.3.8 Meat Consumption in Restaurants

Table 5.9.2 and Figure 5.9 compare the consumption of bison, elk venison and lamb with beef, chicken and fish / seafood when respondents dine out in a sit-down restaurant in the past six month; 82.3% of the respondents never have had bison meat in a restaurant in last six months, and only 16.3% had tried it once or twice. Only 1.43% of the sample population had consumed bison 3 to 5 times, but no one had consumed bison for more than 5 times in the past six months.

Respondents had less experience eating (elk) venison in restaurants; 93.81% of 210 respondents never had venison in a restaurant in the last six months, and only 5.71% of them said they had it once or twice (only one person had tried it 3 to 5 times in a restaurant). Similarly, no one had consumed it over 5 times before. Consumers have relatively more eating experience of lamb in restaurants compared to bison and venison (elk); 23.3% of the 210 respondents have tried lamb in a restaurant; in addition, 3 persons had lamb for about 3 to 5 times, and 4 persons had more than 5 times in the last six months. However, there are over 73% of the consumers who said they never had lamb in a restaurant in the past six months.

The table and figure discussed in this section also indicate that the most frequently consumed meats in restaurants are beef and chicken, given that almost 95% and 94% of the respondents ordered at least once or more in the past six months respectively; moreover, 43% and 45% of the sample population consumed beef and chicken frequently (i.e. more than 5 times) for the last six months. Following the popularity of beef and chicken to Albertans, 75% of them said that they ordered fish in restaurants at least once or more, including 27% and 18% of them who had consumed it 3 to 5 times and more than 5 times. Compared to beef and chicken, lamb consumption in restaurants was very low even though its consumption is relatively higher than that of bison and venison.

5.3.9 Alternative meats for Occasions

Previous literature (Torok et al., 1998; Nelson and Liu, 2005) suggests that alternative meat sales can be higher for special occasions. This survey also investigates this potential marketing opportunity. Table 5.10 and Figure 5.10 suggest that 47.62% of the survey participants would like to choose one of, two of or all of the three meats – bison, lamb, and (elk) venison as regular home meal, followed by 42.38% of people who chose the meat(s) for outdoors activities like barbeque; however, the respondents are not willing to have bison, lamb or venison as part of their meals at the events such as Easter or home parties, as 77.14% and 73.33% of them would not choose these meats.

5.3.10 Meat Consumption at Home

Similarly to section 5.3.9, this survey also looked into consumers' meat consumption at home by asking the frequency of eating meats at home in the last six months. Tables 5.11.1, 5.11.2, and Figure 5.11 show that in comparison to beef, chicken, and fish, the respondents have had much less bison, lamb or venison at home, and 65.71%, 74.76% and 87.14% of them have never had bison, lamb or venison at home respectively; on the other hand, beef, chicken and fish appeared more often on respondents' plates, as 98.10% of them had beef in the past six months, 97.63% of them had chicken and 93.81% of them had fish in the same given period. Moreover, 85.24% of them said they eat beef and chicken over 5 times, followed by fish with 57.14% of population.

5. 3.11 Importance of Information

One question also evaluated the relative importance of various information sources on consumers' choice decision. We considered eight categories of information sources, which are "magazines and newspapers", "TV and Radio", "internet", "friends and family", "flyers", "health professionals", "in-store promotion", and "label on package". The rating scales are defined from 1 to 5, where "extremely important" equals 1, "very important" equals 2, "somewhat important" equals 3, "not very important" equals 4, and "not at all important" equals 5. Except for the category of "label on package" with 167 responses that rated either 1 or 2, the other seven categories have 210 observations rating across all scales.

The survey participants were asked how important the given information sources would be when they bought or would buy bison. According to Table 5.13, and Figure 5.13.1 and Figure 5.13.2, 79.5% of respondents consider that "Label on package" is probably the most important reason for people to buy or not to buy bison, followed by recommendations and advice from "Friends and family" with 61% of respondents choosing 1 or 2. Health professionals' advice and in-store promotion are also important information sources, as 46.2%% and 39.5% of respondents rated them "extremely important" or "very important" respectively. On the other hand, (i) magazines and newspapers, (ii) internet, and (iii) TV and radio, are considered least important for respondents, as they were rated 14.8%, 15.2%, and 18.1% as "extremely important" or "very important" respectively; flyer promotions in store received about 21% of rating as "1" or "2".

5.3.12 Analysis of Socioeconomic and Demographic Characteristics

Table 5.14 and Figure 5.14.1 to 5.14.12 summarize socioeconomic and demographic characteristics of the survey data. The sample consists of 109 females (51.9%) and 97 males (46.2%). 111 out of 210 (52.9%) respondents are married, and 85 or 40.5% of the respondents are not married (14 persons who did not answer this question). On average the household size is 2.7, however 121 out of 210 persons (57.6%) do not have a dependent child at home. The age categories of 30 years to 39 years, 40 years to 49 years, and 50 years to 59 years account for 67% of the consumers in the sample. Consumers were also asked to what extent they consider their roots to be rural or urban; 42% consider their roots to be rural, while 58% consider their roots to be urban. The majority of the respondents indicated that their ethnic background is Canadian (52.9%), and 90% of the consumers resided in Canada for more than 10 years.

In terms of education, 36% of the consumers had college education or less, and 64% had university or higher education. There are five categories of annual income; the largest income group is from the category of $25,000 to $49,000, accounting for 27.6% of the sample size, the categories of less than $24,999 and $70,000 to $99,999 both take the second place, representing 19% of the sample; 17.1% of 210 respondents are from the category of $50,000 to $69,999, and 15.2% of the sample population earn more than $100,000 annually. If we consider the annual income of $50,000 or higher as a middle and high income group, there are about 51.4% of the respondents who fell into this income group.

Two questions about the respondents' lifestyle were included; 54.3% of consumers indicated that they exercise regularly. A majority of the sample population is non-smoker, representing 72.4%.

5.4 Chapter Summary

This chapter discusses the use of focus groups and the development of the bison web-based survey. It also presents the descriptive statistics and frequency distribution of the responses from our web-based survey.

Data Description of the Questionnaire

Table 5.1 Meat Product Features (Focus Groups)

Product Feature	Extremely Important	Very Important	Somewhat Important	Not Very Important	Not at all Important	Don't know
Tenderness and flavour						
Raised locally						
No use of growth hormones, antibiotics, animal protein in raising the animals						
Trace-back certification on packaging (origin)						
Seasoned & Ready-to-Cook meat						
Handling and cooking recommendations on packaging						
Price						
Absence of genetic modification (non-GM)						
Trying something different						
Low Cholesterol and fat						
Meat colour						

Table 5.2: Information Sources (Focus Groups)

"If you have bought (were to buy) bison, how important was (would be) each of the following information sources to you (1 = most important, 5 = least important)."

	Extremely Important	Very Important	Somewhat Important	Not Very Important	Not at all Important	Don't know
magazines, newspapers	1	2	3	4	5	6
TV, radio	1	2	3	4	5	6
Internet	1	2	3	4	5	6
Friends, family	1	2	3	4	5	6
Promotional flyers	1	2	3	4	5	6
Health professionals	1	2	3	4	5	6
In-store promotion	1	2	3	4	5	6
Label on package	1	2	3	4	5	6

Table 5.3A Bison Image

	wild meat	alternative meat	exotic meat
N	210	210	210
Mean	2.60	2.12	2.77
Median	2	2	3
Mode	2	2	2
Sum	546	446	582

Table 5.3.1 "Bison is a wild meat"

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	30	14.29	14.29	14.29
	2	80	38.10	38.10	52.38
	3	47	22.38	22.38	74.76
	4	50	23.81	23.81	98.57
	5	3	1.43	1.43	100.00
	Total	210	100.00	100.00	

Table 5.3.2 "Bison is an alternative meat"

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	41	19.52	19.52	19.52
	2	120	57.14	57.14	76.67
	3	34	16.19	16.19	92.86
	4	12	5.71	5.71	98.57
	5	3	1.43	1.43	100.00
	Total	210	100.00	100.00	

Table 5.3.3 "Bison is an exotic meat"

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	19	9.05	9.05	9.05
	2	73	34.76	34.76	43.81
	3	59	28.10	28.10	71.90
	4	55	26.19	26.19	98.10
	5	4	1.90	1.90	100.00
	Total	210.00	100.00	100.00	

Table 5.3B Venison Image

	wild meat	alternative meat	exotic meat
N	210	210	210
Mean	1.85	2.304	2.66
Median	2	2	3
Mode	2	2	2

Table 5.3.4 "Venison is a wild meat"

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	74	35.24	35.24	35.24
	2	104	49.52	49.52	84.76
	3	22	10.48	10.48	95.24
	4	9	4.29	4.29	99.52
	5	1	0.48	0.48	100.00
	Total	210	100.00	100.00	

Table 5.3.5 "Venison is an alternative meat"

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	36	17.14	17.14	17.14
	2	106	50.48	50.48	67.62
	3	39	18.57	18.57	86.19
	4	26	12.38	12.38	98.57
	5	3	1.43	1.43	100.00
	Total	210	100.00	100.00	

Table 5.3.6 "Venison is an exotic meat"

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	22	10.48	10.48	10.48
	2	78	37.14	37.14	47.62
	3	68	32.38	32.38	80.00
	4	34	16.19	16.19	96.19
	5	8	3.81	3.81	100.00
	Total	210	100.00	100.00	

Table 5.4.1 Descriptive Statistics of Meat Attributes (n = 210)

Meat Attribute	Code[4]	Mean	Std. Deviation
tenderness and flavour	Q3_A	1.77	1.03
raised locally	Q3_B	2.85	1.09
no growth hormones and antibiotics	Q3_C	2.15	1.24
trace-back certification on package	Q3_D	2.42	1.30
seasoned and ready to cook	Q3_E	3.50	1.23
cooking recommendations on package	Q3_F	2.67	1.23
price	Q3_G	2.23	1.01
no genetic modification (non-GM)	Q3_H	2.42	1.34
trying something different	Q3_I	2.80	1.16
low cholesterol and fat	Q3_J	2.42	1.16
meat colour	Q3_K	2.70	1.16

Table 5.4.2 Importance Rating of the Meat Attributes (n = 210)

Meat Attribute	Code	Importance Rating
tenderness and flavour	Q3_A	91.43%
no growth hormones and antibiotics	Q3_C	67.14%
price	Q3_G	65.24%
low cholesterol and fat	Q3_J	60.00%
trace-back certification on package	Q3_D	58.10%
no genetic modification (non-GM)	Q3_H	55.24%
cooking recommendations on package	Q3_F	46.19%
meat colour	Q3_K	46.19%
trying something different	Q3_I	41.43%
raised locally	Q3_B	38.10%
seasoned and ready to cook	Q3_E	21.43%

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[4] "Code" represents the meat attribute in the survey dataset respectively, e.g. Q3_A represents "tenderness and flavour" in the dataset.

Table 5.4.3 Frequencies of the Meat Attributes

	Q3_A		**Q3_B**		**Q3_C**	
Code	**Frequency**	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
1	92	43.81	21	10.00	81	38.57
2	100	47.62	59	28.10	60	28.57
3	9	4.29	77	36.67	41	19.52
4	1	0.48	42	20.00	19	9.05
5	0	0.00	6	2.86	2	0.95
6	8	3.81	5	2.38	7	3.33
Total	210	100.00	210	100.00	210	100.00

	Q3_D		**Q3_E**		**Q3_F**	
Code	**Frequency**	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
1	62	29.52	15	7.14	39	18.57
2	60	28.57	30	14.29	58	27.62
3	45	21.43	52	24.76	69	32.86
4	31	14.76	67	31.90	26	12.38
5	5	2.38	40	19.05	13	6.19
6	7	3.33	6	2.86	5	2.38
Total	210	100.00	210	100.00	210	100.00

	Q3_G		**Q3_H**		**Q3_I**	
Code	**Frequency**	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
1	49	23.33	68	32.38	25	11.90
2	88	41.90	48	22.86	62	29.52
3	59	28.10	54	25.71	76	36.19
4	9	4.29	27	12.86	32	15.24
5	0	0.00	4	1.90	8	3.81
6	5	2.38	9	4.29	7	3.33
Total	210	100.00	210	100.00	210	100.00

	Q3_J		**Q3_K**	
Code	**Frequency**	**Percent**	**Frequency**	**Percent**
1	42	20.00	30	14.29
2	84	40.00	67	31.90
3	56	26.67	70	33.33
4	15	7.14	28	13.33
5	7	3.33	10	4.76
6	6	2.86	5	2.38
Total	210	100.00	210	100.00

Table 5.5 Descriptive Statistics for the Reasons not to Buy Bison

Reason	Code	Mean	Median
Lack of Promotion and Advertising	Q4_A	2.79	3
Lack of Availability	Q4_B	2.10	2
Lack of Cooking or Preparation Experience	Q4_C	2.78	3
In-store Packaging Unappealing	Q4_D	3.29	3
Disease-related Issues	Q4_E	3.10	3

Table 5.5.1 Q4_A = Lack of Promotion and Advertising

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	56	26.67	26.67	26.67
	2	47	22.38	22.38	49.05
	3	39	18.57	18.57	67.62
	4	22	10.48	10.48	78.10
	5	46	21.90	21.90	100.00
	Total	210	100.00	100.00	

Table 5.5.2 Q4_B = Lack of Availability

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	82	39.05	39.05	39.05
	2	62	29.52	29.52	68.57
	3	39	18.57	18.57	87.14
	4	18	8.57	8.57	95.71
	5	9	4.29	4.29	100.00
	Total	210	100.00	100.00	

Table 5.5.3 Q4_C = Lack of Cooking or Preparation Experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	49	23.33	23.33	23.33
	2	46	21.90	21.90	45.24
	3	53	25.24	25.24	70.48
	4	27	12.86	12.86	83.33
	5	35	16.67	16.67	100.00
	Total	210	100.00	100.00	

Table 5.5.4 Q4_D = In-store Packaging Unappealing

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	32	15.24	15.24	15.24
	2	22	10.48	10.48	25.71
	3	53	25.24	25.24	50.95
	4	59	28.10	28.10	79.05
	5	44	20.95	20.95	100.00
	Total	210	100.00	100.00	

Table 5.5.6 Q4_E = Disease-related Issues

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	64	30.48	30.48	30.48
	2	17	8.10	8.10	38.57
	3	31	14.76	14.76	53.33
	4	31	14.76	14.76	68.10
	5	67	31.90	31.90	100.00
	Total	210	100.00	100.00	

Table 5.6 the Consumption of Organic Food (n = 210)

	Code	Frequency	Percent	Valid Percent	Cumulative Percent
never buy	1	59	28.10	28.10	28.10
once or twice	2	43	20.48	20.48	48.57
3 to 5 times	3	45	21.43	21.43	70.00
over 5 times	4	35	16.67	16.67	86.67
not sure	5	28	13.33	13.33	100.00
		210	100.00	100.00	

Table 5.7 Meals at Home

Descriptive Statistics

N	Mean	Minimum	Maximum	Std. Deviation
210	12.08	0	73	7.92

	Frequency	Cumulative Percent
0 to 7 times	74	35.24
8 to 14 times	68	32.38
15 to 21 times	64	30.48

Table 5.8 Methods of Cooking (as per cent)

Code	Description	N	Mean	Median	Std. Dev.
Q8_A	Cooked from scratch	210	55.54	60	24.18
Q8_B	Using prepared food items	210	18.64	15	16.41
Q8_C	Using both scrach and prepared items	210	25.81	20	18.91

Table 5.9.1 Descriptive Statistics of Meat Consumption in Restaurant

Descriptive Statistics

Meat	Code	N	Min.	Max.	Mean	Std. Dev.	Variance
bison	Q9_A	210	1*	3	1.19	0.43	0.18
lamb	Q9_B	210	1	4	1.32	0.60	0.36
venison	Q9_C	210	1	3	1.07	0.27	0.07
beef	Q9_D	210	1	4	3.07	0.95	0.90
chicken	Q9_E	210	1	4	3.07	0.98	0.95
fish/seafood	Q9_F	210	1	4	2.37	1.05	1.10
	Valid N	210					

*1=none, 2=once or twice, 3=3 to 5 times, and 4=over 5 times.

Table 5.9.2 Frequencies of Meat Consumption in Restaurant (n=210)

	none	once or twice	3 to 5 times	over 5 times
beef	5.24%	25.71%	26.19%	42.86%
chicken	6.19%	25.71%	23.33%	44.76%
fish/seafood	25.24%	30%	27.14%	17.62%
lamb	73.33%	23.33%	1.43%	1.90%
bison	82.38%	16.19%	1.43%	0
venison	93.81%	5.71%	0.48%	0

Table 5.10 Alternative Meats for Occasional Events

	regular home meal	celebration (e.g. Easter)	Outdoor/ BBQ	Parties at home
choose	47.62%	22.86%	42.38%	26.67%
not choose	52.38%	77.14%	57.62%	73.33%

Table 5.11.1 Meat Consumption at Home (n=210)

code	Description	bison	lamb	venison	beef	chicken	fish
1	none	65.71%	74.76%	87.14%	1.90%	2.38%	6.19%
2	once or twice	19.05%	16.19%	8.57%	5.71%	2.38%	14.76%
3	3 to 5 times	7.14%	4.29%	2.38%	7.14%	10%	21.90%
4	over 5 times	8.10%	4.76%	1.90%	85.24%	85.24%	57.14%

Table 5.11.2 Description of Meat Consumption at Home

	bison	lamb	venison	beef	chicken	fish
N	210	210	210	210	210	210
	0	0	0	0	0	0
Mean	1.58	1.39	1.19	3.76	3.78	3.30
Median	1	1	1	4	4	4
Mode	1	1	1	4	4	4

Table 5.12 Choice Frequencies

Choice Set 1

	Choice	Frequency	Percent
beef	1	148	70.48
bison	2	47	22.38
opt-out	3	15	7.14
N	Total	210	100

Choice Set 2

	Choice	Frequency	Percent
beef	1	159	75.71
bison	2	33	15.71
opt-out	3	18	8.571
N	Total	210	100

Choice Set 3

	Choice	Frequency	Percent
beef	1	157	74.761905
bison	2	34	16.190476
opt-out	3	19	9.047619
N	Total	210	100

Choice Set 4

	Choice	Frequency	Percent
beef	1	163	77.619048
bison	2	31	14.761905
opt-out	3	16	7.6190476
N	Total	210	100

Table 5.13 Importance of Information

	extremely important	very important	somewhat important	not very important	not at all important	don't know
Magazines & Newspapers	5.24%	9.52%	29.52%	24.29%	26.67%	4.76%
TV & Radio	6.67%	11.43%	25.24%	28.10%	24.29%	4.29%
Internet	4.76%	10.48%	31.43%	25.24%	23.33%	4.76%
Friends &Family	21.43%	39.52%	25.24%	6.19%	4.76%	2.86%
Flyers	7.14%	13.81%	33.81%	24.76%	17.14%	3.33%
Health Professionals	16.19%	30%	25.71%	14.29%	10%	3.81%
In-store Promotion	10.48%	29.05%	32.86%	14.29%	9.52%	3.81%
Label on Package	28.57%	50.95%	0.00%	0.00%	0.00%	0.00%

Table 5.14 Respondents' Socioeconomic and Demographic Statistics

Locale		Frequency	Percent
	not answered	5	2.38
	rural	82	39.05
	urban	123	58.57
	Total	210	100

Gender		Frequency	Percent
	not answered	4	1.90
	female	109	51.90
	male	97	46.19
	Total	210	100

Income		Frequency	Percent
Valid	not answered	4	1.90
	Less than $24,999	40	19.05
	$25,000-$49,999	58	27.62
	$50,000-$69,999	36	17.14
	$70,000-$99,999	40	19.05
	More than $100,000	32	15.24
	Total	210	100

Education	Frequency	Percent
not answered	4	1.90
Elementary	9	4.29
High School	61	29.05
College	79	37.62
University	46	21.90
Graduate School	11	5.24
Total	210	100

Ethnicity	Frequency	Percent
not answered	4	1.90
African	1	0.48
Asian	8	3.81
British Isles	42	20.00
Canadian	111	52.86
European	34	16.19
French	2	0.95
Other/Not Listed	8	3.81
Total	210	100

Age		Frequency	Percent
	not answered	4	1.90
	under 20	10	4.76
	20-24	16	7.62
	25-29	22	10.48
	30-39	45	21.43
	40-49	47	22.38
	50-59	49	23.33
	60-69	15	7.14
	70 and over	2	0.95
	Total	210	100

Residence	Frequency	Percent
not answered	4	1.90
less than 5 years	12	5.71
5 - 10 years	5	2.38
more than 10 years	189	90
Total	210	100

Marriage	Frequency	Percent
not answered	14	6.67
no	85	40.48
yes	111	52.86
Total	210	100

Do you smoke?	Frequency	Percent
not answered	4	1.90
no	152	72.38
yes	54	25.71
Total	210	100

Do you exercise regularly?	Frequency	Percent
not answered	4	1.90
no	92	43.81
yes	114	54.29
Total	210	100

(To be continued in the next page)

Table 5.14 Respondents' Socioeconomic and Demographic Statistics

(Continued)

Children at home	Frequency	Percent	Household Size	Frequency	Percent
0	121	57.62	0	24	11.43
1	38	18.10	1	24	11.43
2	31	14.76	2	60	28.57
3	13	6.19	3	32	15.24
4	2	0.95	4	42	20
5	1	0.48	5	18	8.57
not answered	4	1.90	6	2	0.95
answered	206	98.10	7	1	0.48
Total	210	100	8	1	0.48
			30	1	0.48
			not answered	5	2.38
			answered	205	97.62
			Total	210	100

Figure 5.3 Bison Meat Image[5]

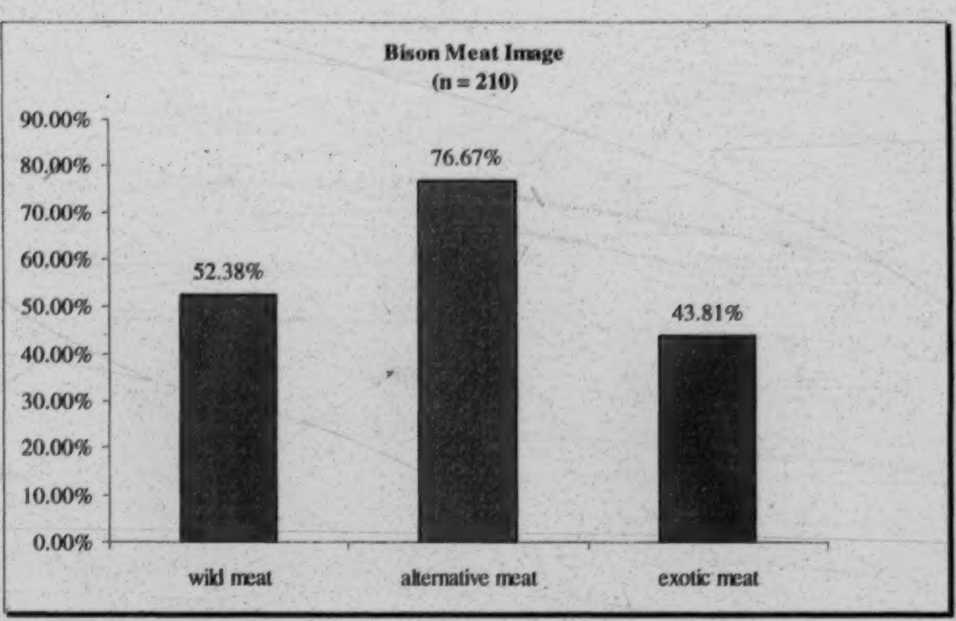
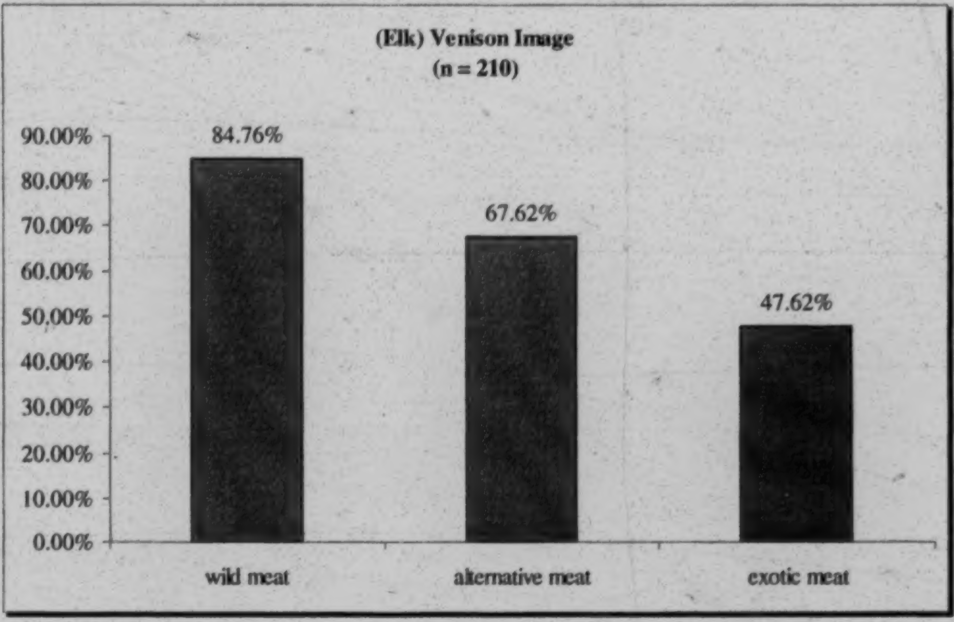


Figure 5.4 Venison Image



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[5] As presented in question 1 of the survey questionnaire, the respondents rated the image of bison for all the three categories, therefore the percentages are not added up to 100 per cent in Figure 5.3; it is similar with venison image.

Figure 5.5 Reasons Not to Buy Bison

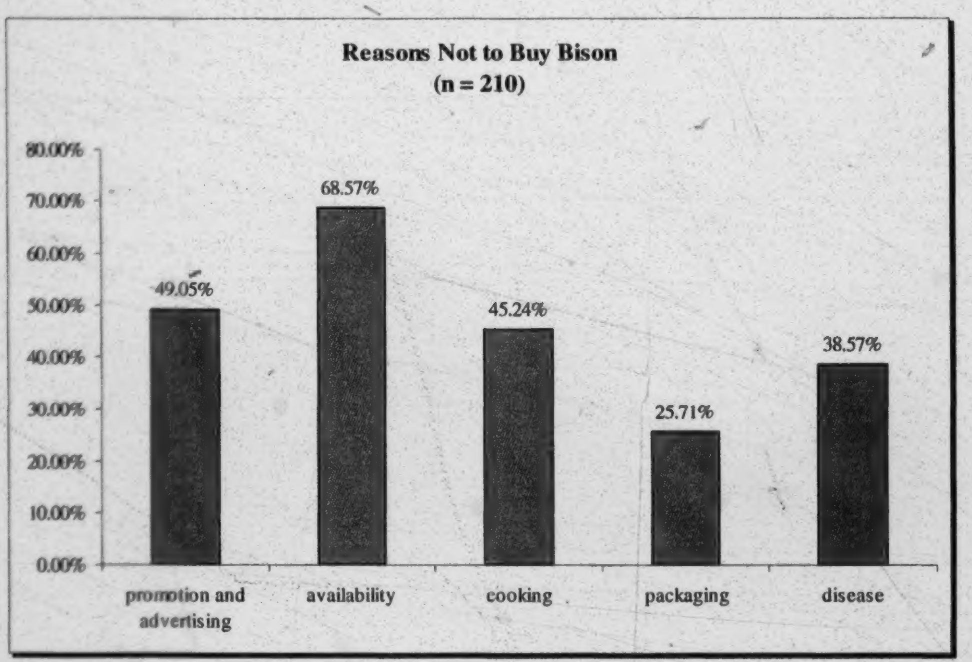


Figure 5.6 the Consumption of Organic Foods

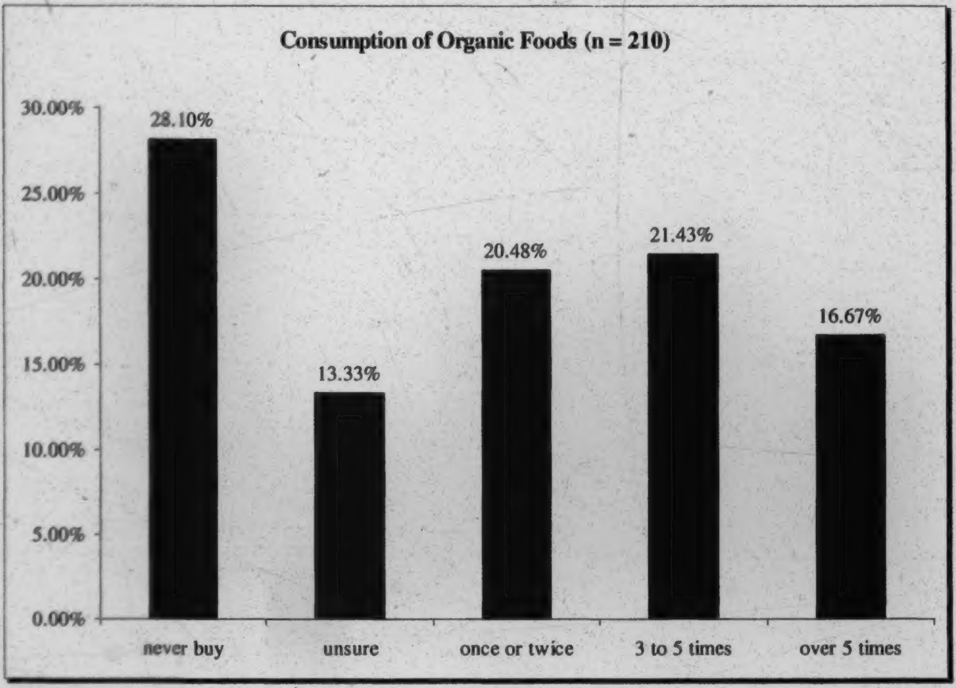


Figure 5.7 Meals at Home

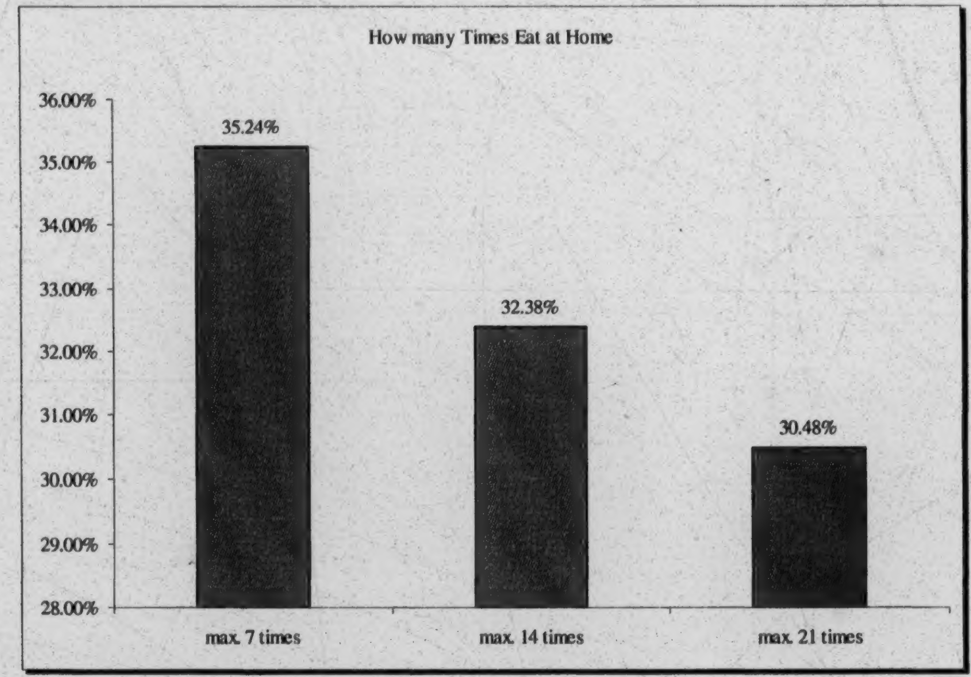


Figure 5.8 Methods of Cooking

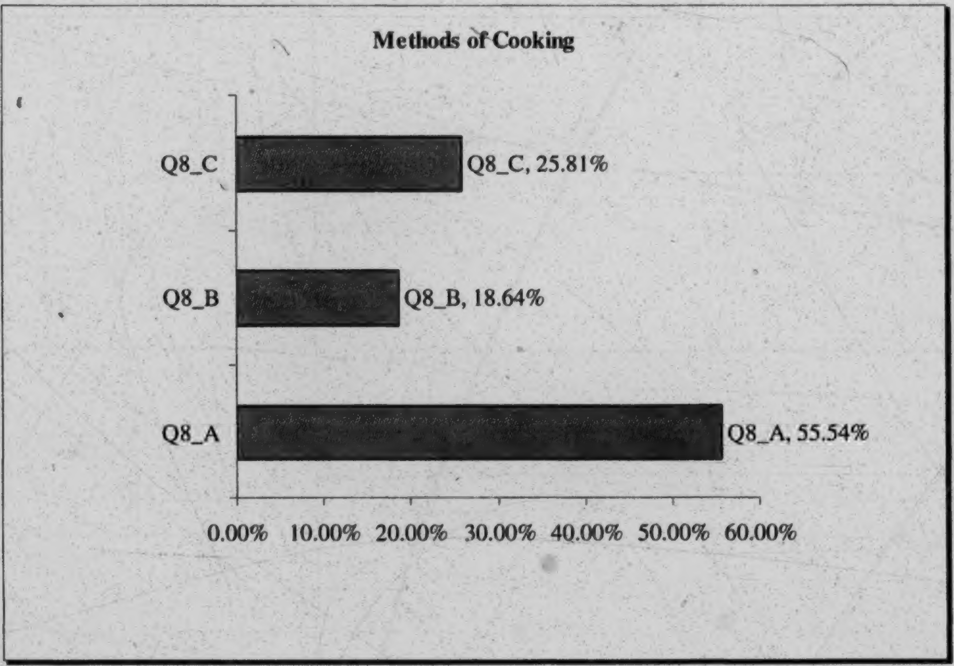


Figure 5.9.1 Meat Consumption in Restaurant: Comparison of Bison, Venison and Lamb

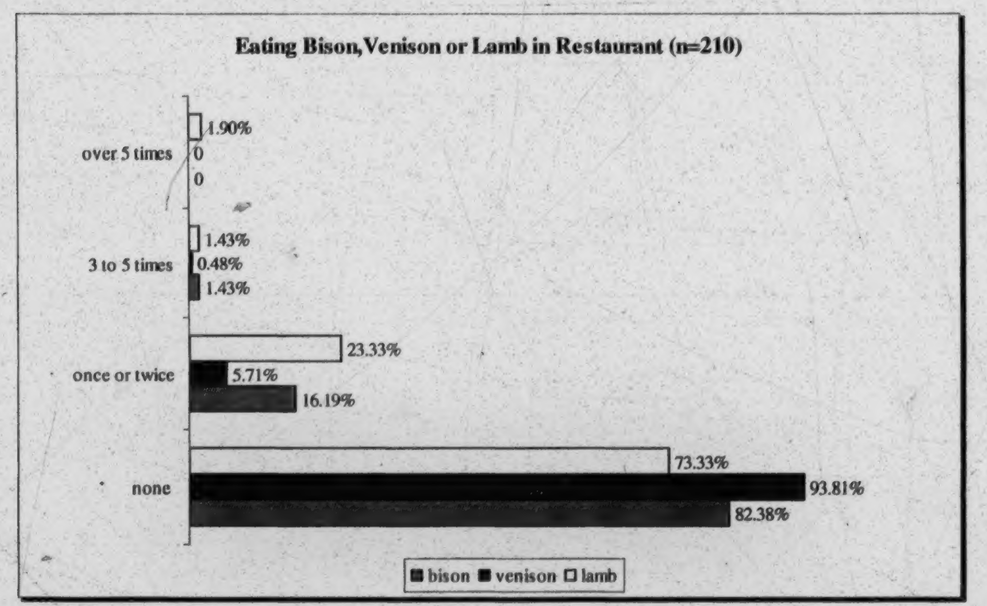


Figure 5.9.2 Meat Consumption in Restaurant: Comparison of Beef, Chicken, Fish and Lamb

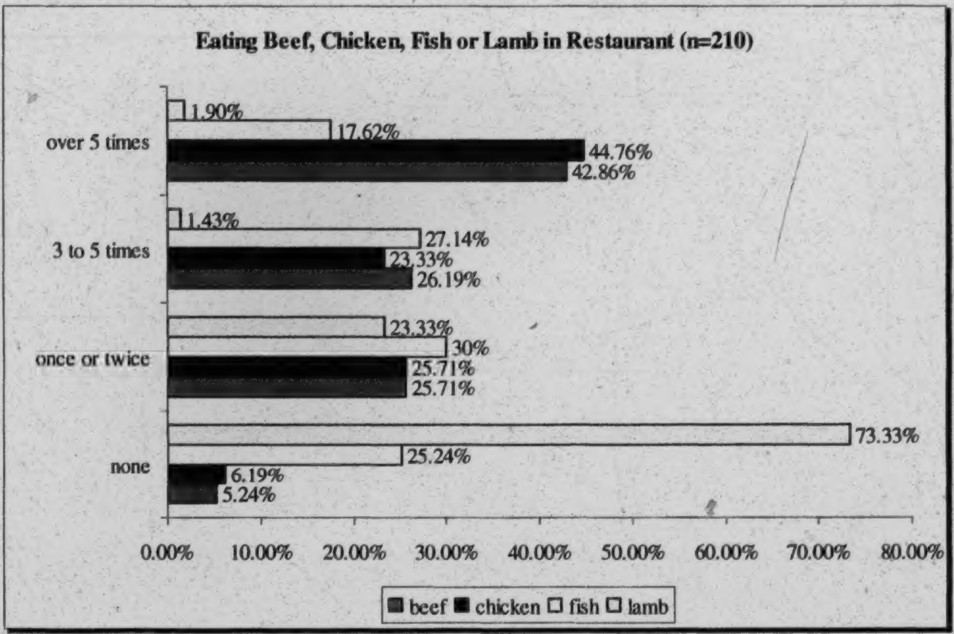


Figure 5.10 Alternative Meats for Occasional Events

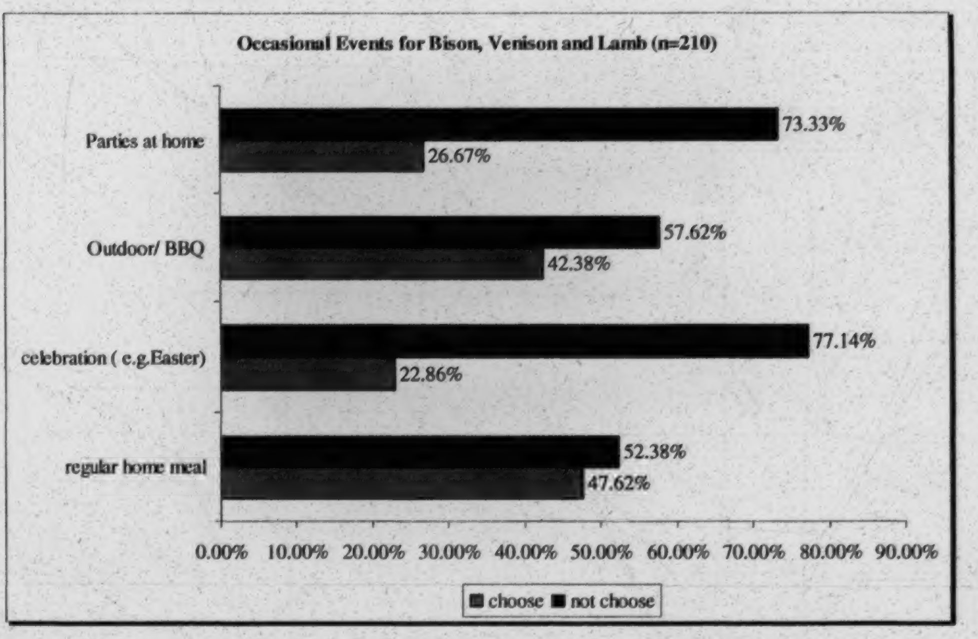


Figure 5.11 Meat Consumption at Home (in the last 6 months)

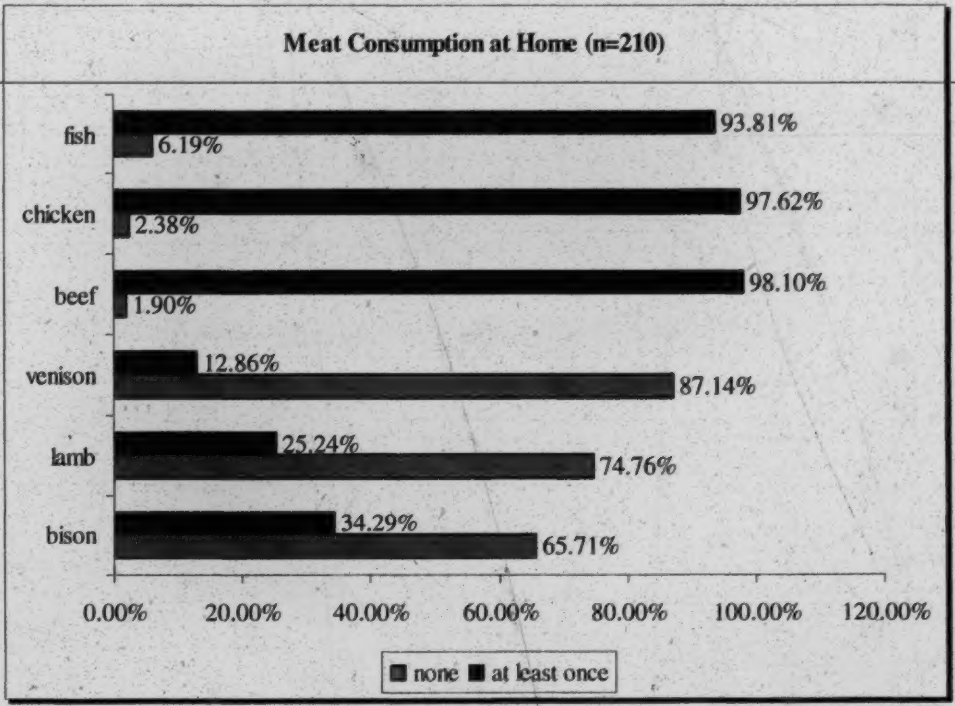


Figure 5.13.1 Rating of the Information Source*

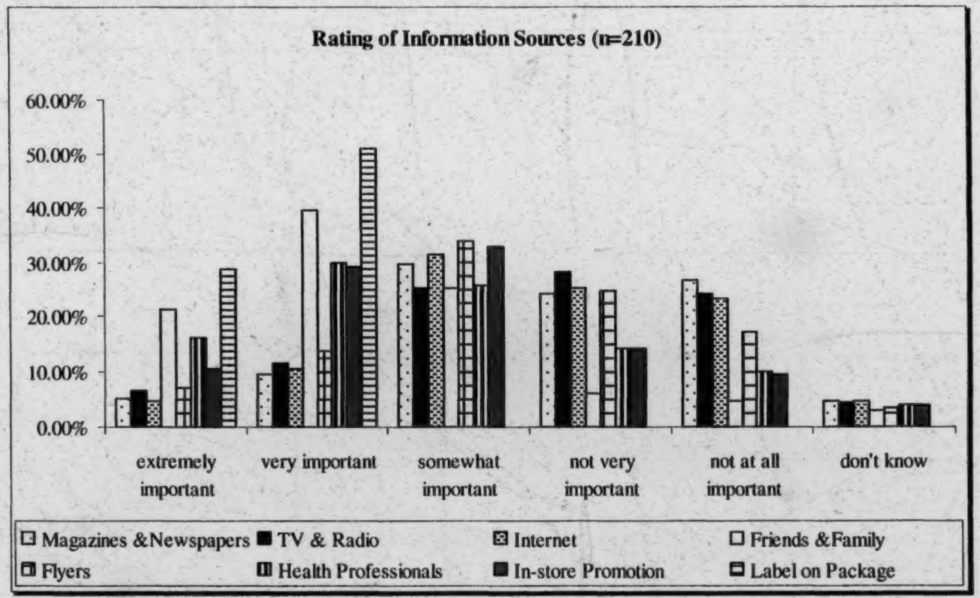
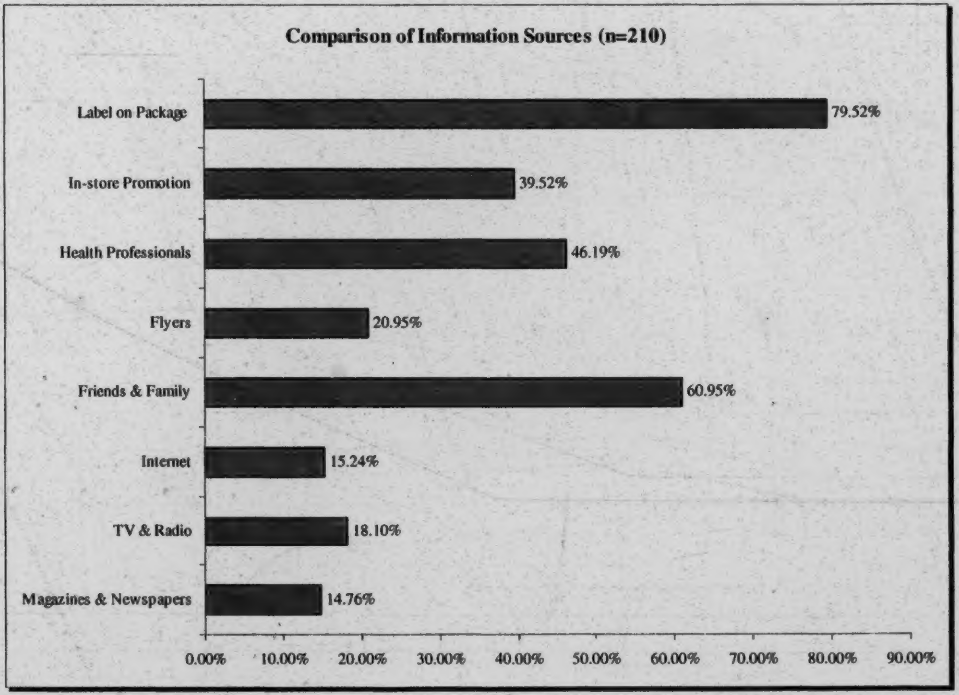


Figure 5.13.2 Ranking of Information Sources[6]



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[6] n = 210 except for "Label on Package", where n = 167.

Respondents' Socioeconomic and Demographic Characteristics

(n=210)

Figure 5.14.1 Gender

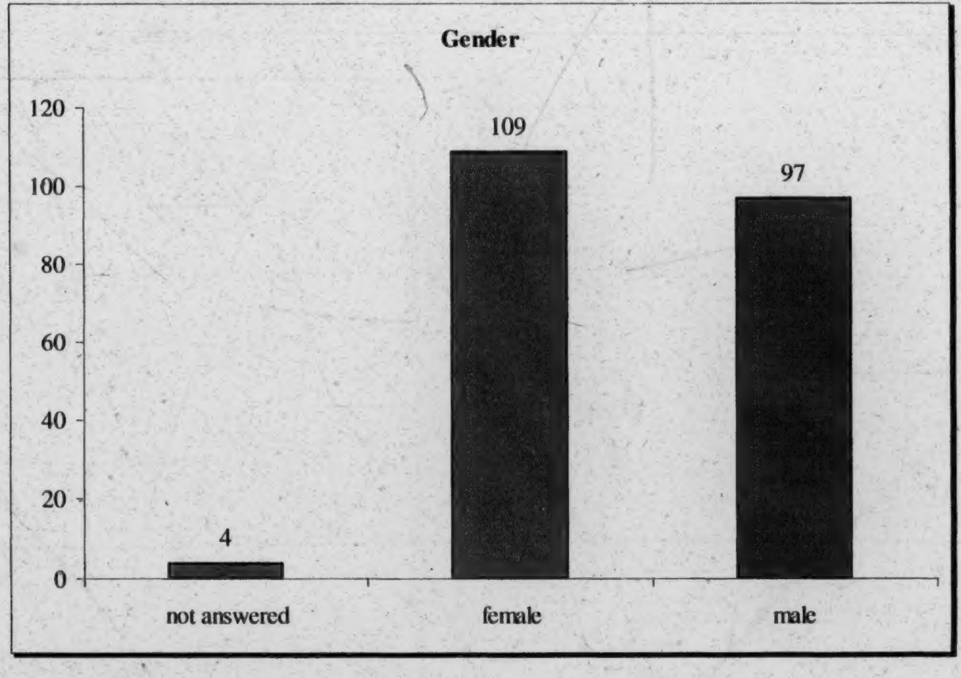


Figure 5.14.2 Urban vs. Rural Roots

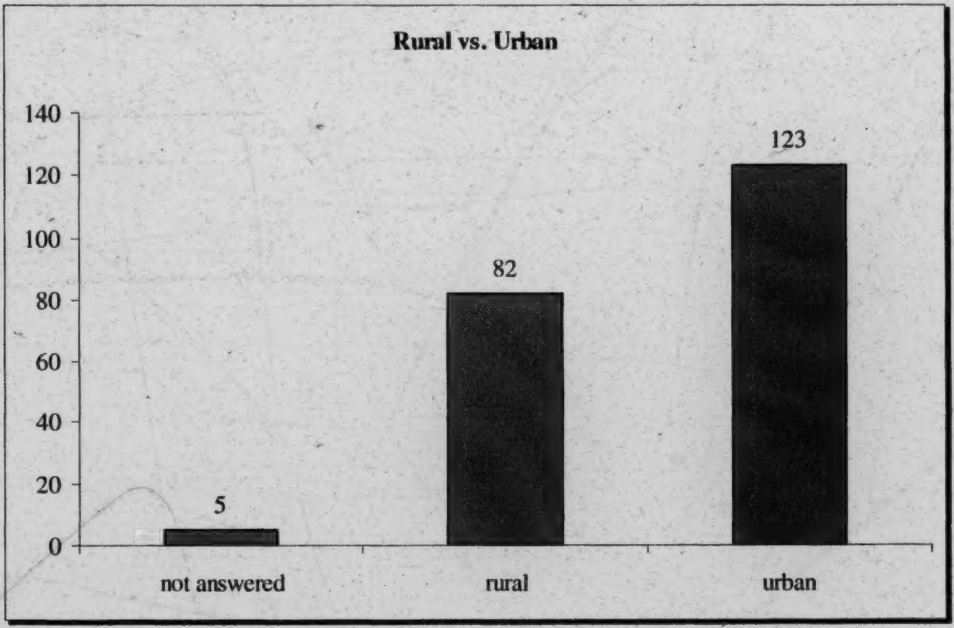


Figure 5.14.3 Income

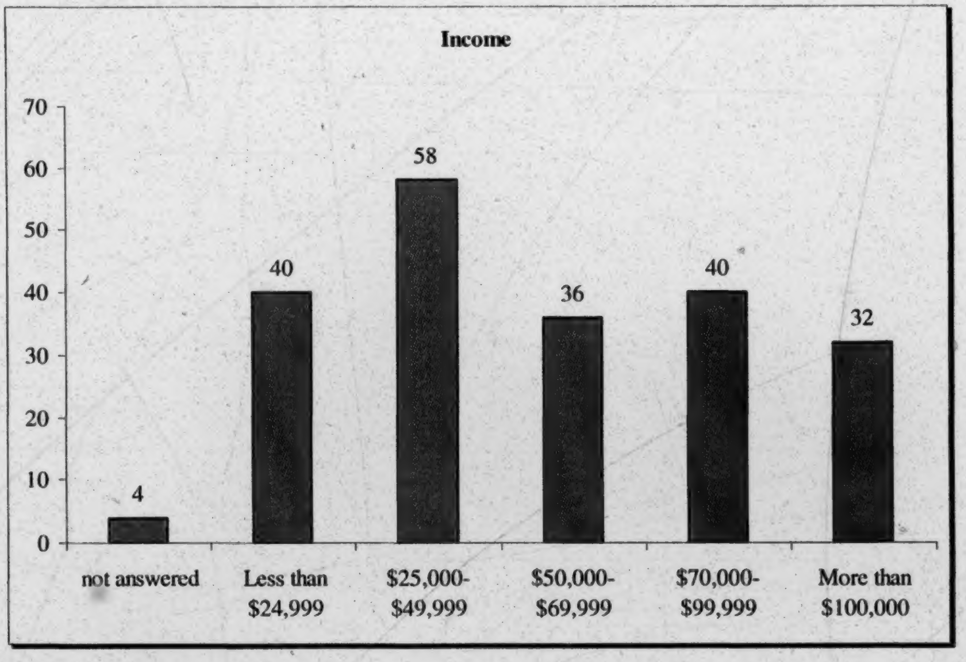


Figure 5.14.4 Education

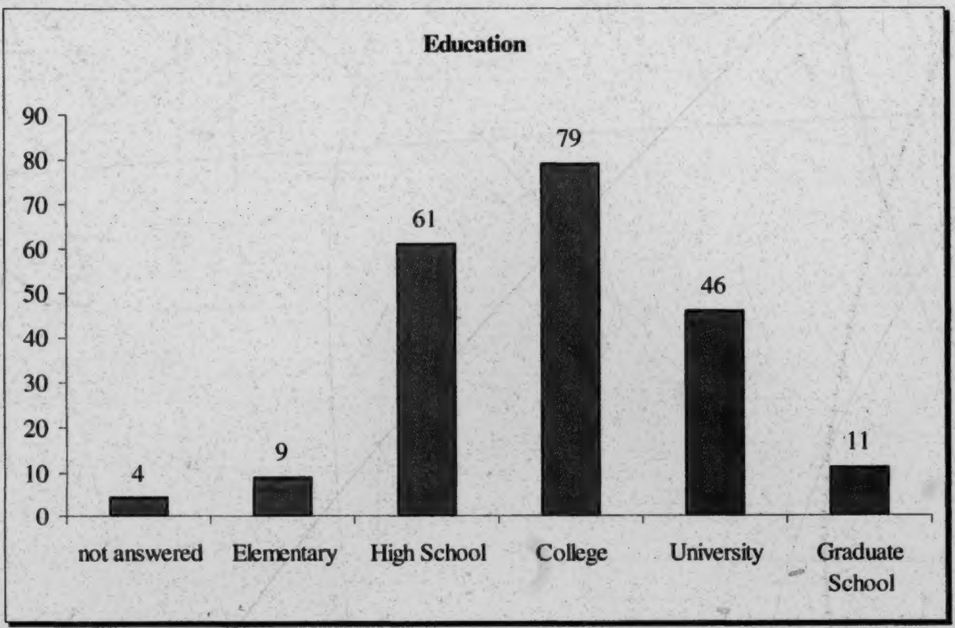


Figure 5.14.5 Ethnic Backgrounds

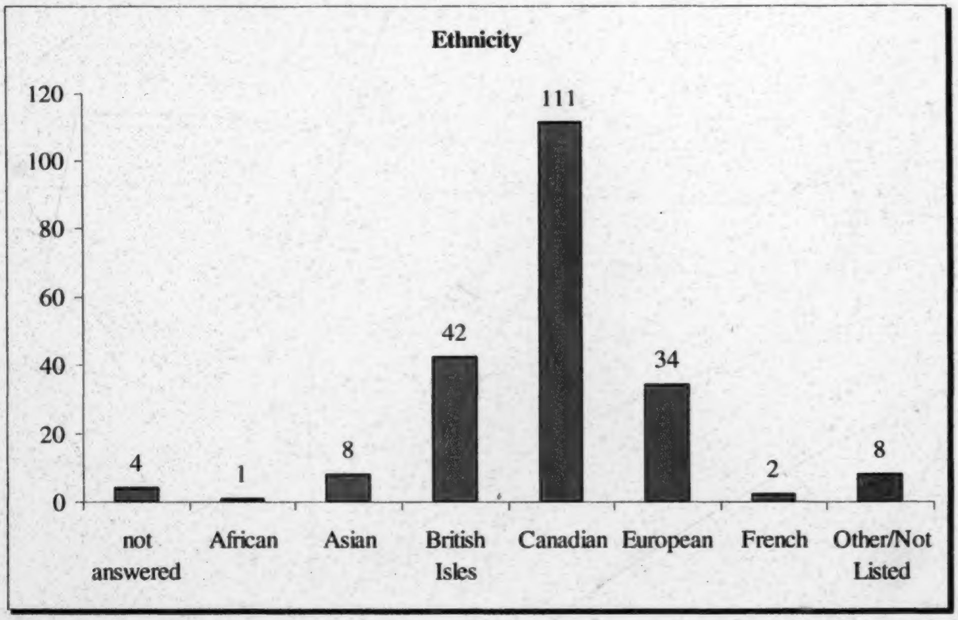


Figure 5.14.6 Age

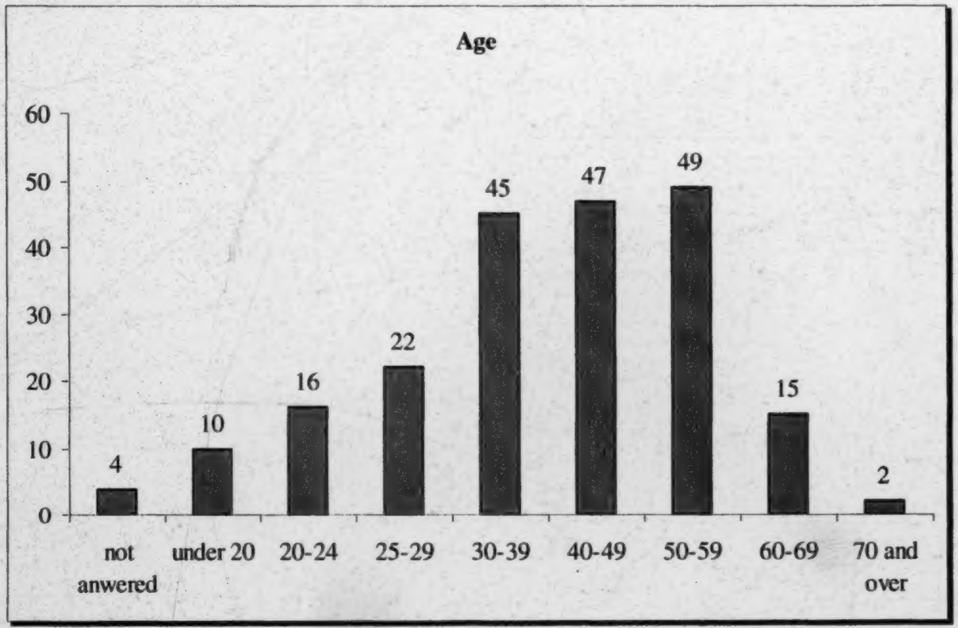


Figure 5.14.7 Years of Residence in Canada

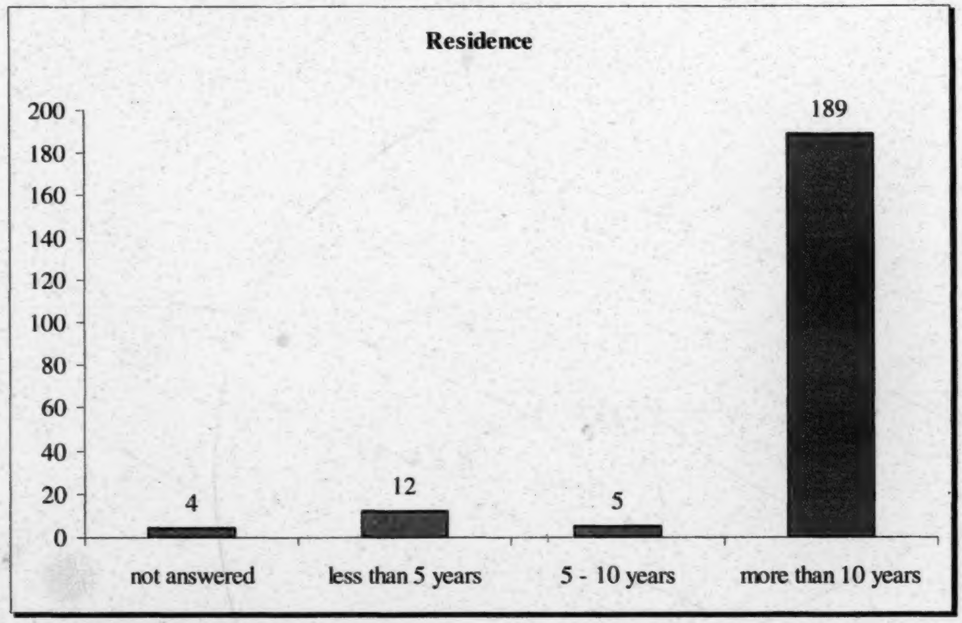


Figure 5.14.8 Marital Status

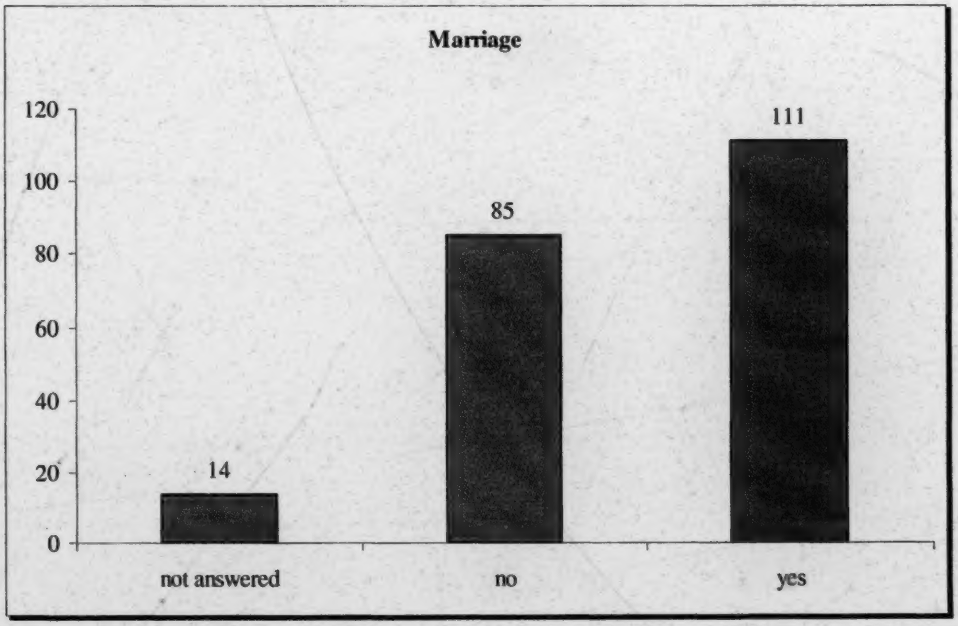


Figure 5.14.9 the Number of Dependent Children at Home

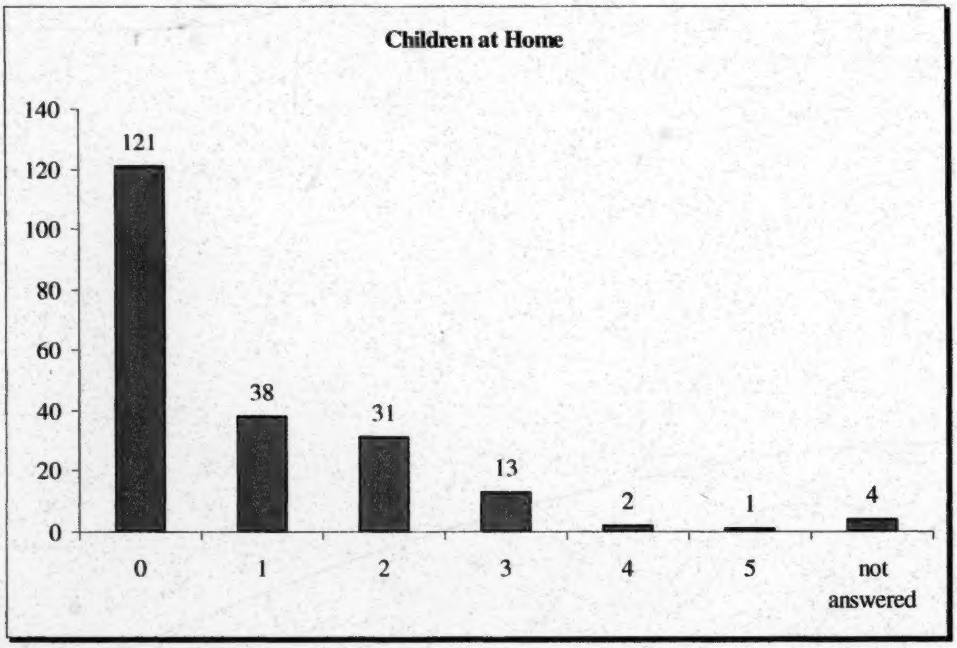


Figure 5.14 10 Household Size

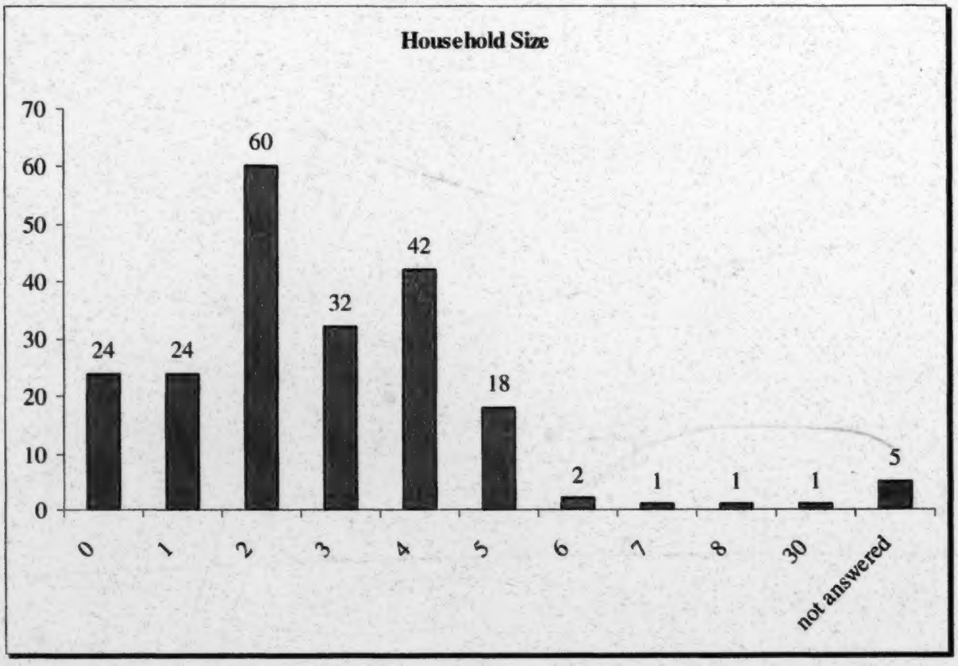


Figure 5.14.11 "Do you exercise regularly?"

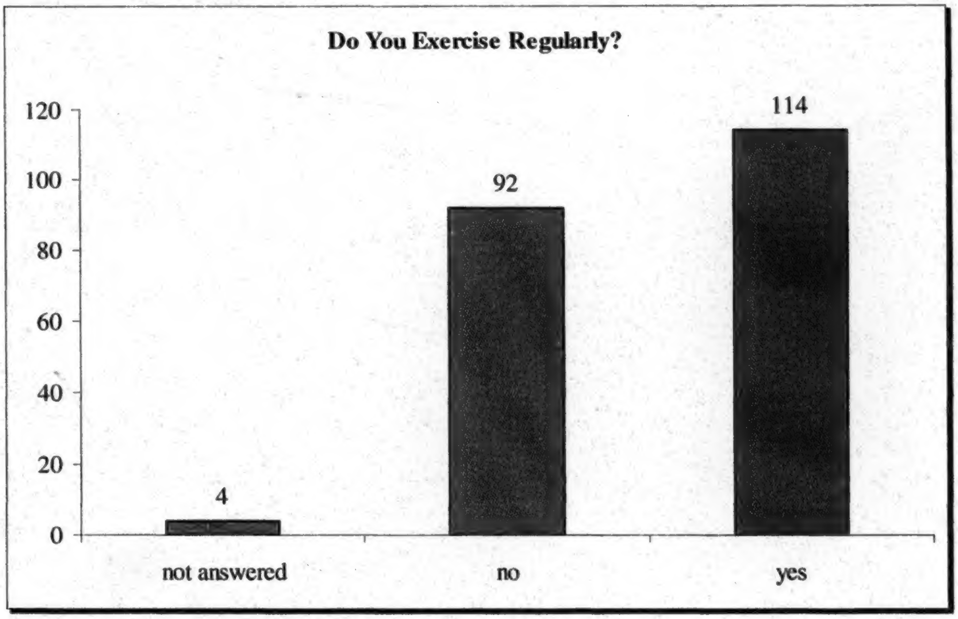
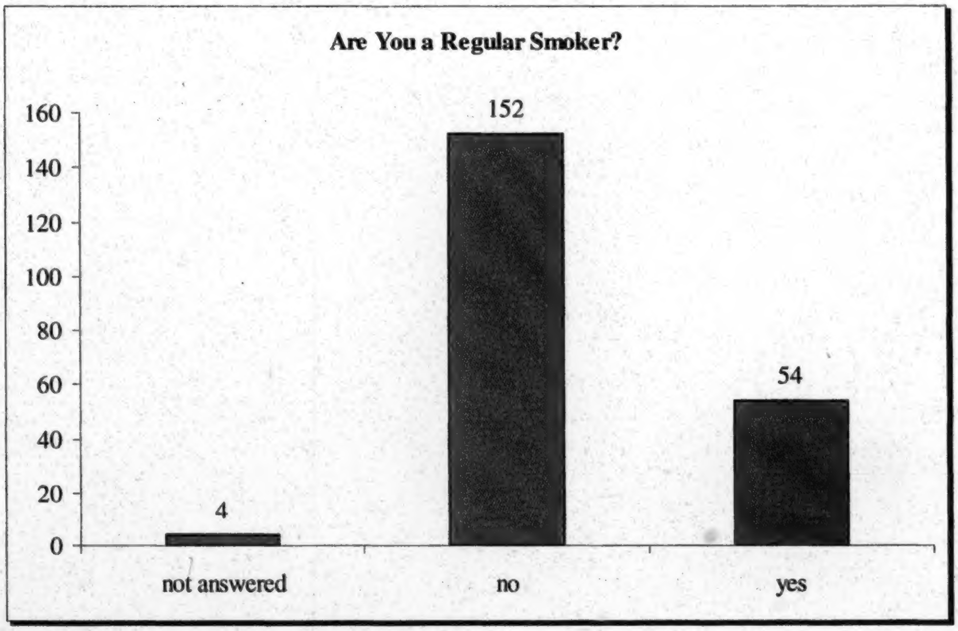


Figure 5.14.12 "Are you a regular smoker?"



Chapter 6: Estimation and Results

6.1 Introduction

This chapter discusses the process of model development and discusses the model results. Section 6.2 provides a description of the independent variables; section 6.3 discusses the basic choice models; section 6.4 outlines some issues that occurred during model development; and section 6.5 presents the finalized model and discusses the results together with the implications of the empirical model.

6.2 Basic Models and Discussion

6.2.1 Utility Functions

Table 6.1 describes the attributes and their levels used in the choice experiments (CE) of the web-based survey. First, a model was estimated without considering consumers' socio-economic and demographic characteristics. This was done in order to investigate how respondents' choice behaviour would be affected by only a change of attribute levels.

Given the attributes of beef and bison specified in this study, with β's as parameters to be estimated and e_i as unknown error terms, the indirect utility of respondent *i* choosing alternative (product) *j* can be defined based on a random utility framework as:

$$U_{ij} = \beta_1 \text{Price} + \beta_2 \text{Traceability} + \beta_3 \text{NOGMO} + \beta_4 \text{Fat1} + \beta_5 \text{Fat2} + \beta_6 \text{Fat3} + e_j \quad \text{(Model 1)}$$

$$U_{ij} = \beta_1 \text{Price} + \beta_2 \text{Traceability} + \beta_3 \text{NOGMO} + \beta_4 \text{FA1} + \beta_5 \text{FA2} + \beta_6 \text{FA3} + \beta_7 \text{FB1} + \beta_8 \text{FB2} + \beta_9 \text{FB3} + e_j \quad \text{(Model 2)}$$

$$U_{ij} = \beta_1 \text{Price} + \beta_2 \text{Traceability} + \beta_3 \text{NOGMO} + \beta_4 \text{EC1} + \beta_5 \text{EC2} + \beta_6 \text{EC3} + e_j \quad \text{(Model 3)}$$

where PRICE is the attribute of price in the choice experiments for beef and bison respectively; NOGMO is a dummy-coded variable, with 1 meaning "yes, have certified label GMO-free", and 0 meaning "no such label".[7] Traceability is a dummy-coded variable, with 1 meaning "yes, have certified farm origin traceability label", and 0 meaning "no such label". Fat1, Fat2, Fat3, and Fat4 are four dummy-coded variables for the 4 fat levels, assuming initially that there is no differential impact between beef fat and bison fat for respondents. FA1 to FA4 are four dummy coded beef fat variables and FB1 to FB4 are four dummy-coded bison fat variables, since tests are performed to explore the potential differential impact of both. Finally, EC1, EC2, and EC3 denote effects-coded fat variables.

Table 6.3 is the empirical results of basic models. In Model 1 FAT4 denotes the base group, and is dropped out; Model 2 is to investigate whether respondents perceive beef fat and bison fat differently; Fat levels are effects-coded in Model 3, and the difference between dummy-coding and effects-coding will be discussed in later sections.

ASC1 and ASC3 are *alternative specific constants* (ASCs). ASCs represent the unobserved sources of utility. In our study, ASC1 denotes choice 1, beef, and ASC3 is for choice 3, "neither beef nor bison". These are compared to choice 2, bison (ASC2), which is omitted as the base group in estimation, so as to avoid perfect multicollinearity. A description of the independent variables is provided in Table 6.2.1.

Table 6.2.2 gives the summary statistics for the above demographic variables that are estimated in the empirical models. 47.1% of the respondents are male; 40.0% of them consider their roots are from rural background; 26.2% of the sample are regular smokers, and 55.3% of the respondents exercise regularly; 56.7% of the respondents are married, and 40.5% of the respondents have at least one dependent child; the average age of the sample is about 40 years old with the average annual gross income of $56,000; 27.1% of the respondents receive university or higher education. In addition, 30.0% of the respondents are frequent organic food buyers, as they buy organic food 3 to 5 times or more per month.

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[7] The distinction between dummy-coding and effects-coding will be further explained in section 6.2.4.

Income (INCOME) and age (AGE) are initially categorical coded, however, to simplify the model estimation and to reduce the number of dependant variables, they are transferred to the mean points of each category. For example, for the age category of "40 to 49 years", the value equals the mean of 40 and 49 which is 44.5 years; similarly, other age categories and the income categories are transferred to their mean points respectively, so that income and age are treated as if their values are continuous.

6.2.2 Results of Basic Models

The results from all the three models show that price, fat levels, non-GMO labeling are significant attributes associated with a respondent's utility function. Price (PRICE) is statistically significant at 1% level with negative sign, indicating that as price of the alternative increases, a respondent's utility will decrease, and the probability to choose this alternative will decrease; non-GMO labeling (NOGMO) is statistically significant at 1% level with positive sign, which implies that the meat buyer is more likely to choose non-GMO certified meat steaks; the estimated parameter of traceability (TR) is positive, but not statistically significant, which suggests that traceability labeling will not increase respondents' utility. Also, people prefer not to buy high fat meat cuts, but rather low or medium fat meat cuts, as well as meat cuts with trimmable fat. According to model 1, 2 and 3, the *alternative specific constants* (ASCs), ALT1 and ALT3, are statistically significant different from zero at 1% level. It can be concluded that consumers' preference order is beef, bison, and choosing neither beef nor bison.

6.2.3 Beef Fat versus Bison Fat

Model 2 assumes that consumers perceive beef fat and bison fat differently. Therefore, FA1 to FA4 denote four beef fat levels, and FB1 to FB4 denote four bison fat levels. These 8 variables are all dummy-coded, and the utility function is presented as Model 2.

Estimation results indicate that the coefficients of PRICE, NOGMO, and TR are similar to the other three models. However, the estimated parameters of beef fat and bison fat are different. FA1, FA2, and FA3 are all insignificant, and the signs of beef fat levels are also ambiguous. The results indicate that respondents are indifferent towards four beef fat levels, yet consumers show some preference for choosing high-fat beef steaks. With regards to bison, respondents prefer to choose lower fat bison steak, and the results suggest that consumers are unlikely to choose high-fat bison steak.

To examine the hypothesis that consumers perceive beef fat and bison fat identically, a joint Wald test is conducted. This test explores whether the coefficients of FA1 and FB1, FA2 and FB2, and FA3 and FB3 are significantly different. In this particular model specification, 3 linear restrictions are imposed. The test-statistic for this test is a Chi-square statistic with the degree of freedom equal to the number of linear restriction imposed upon the model (Hensher et al. 2005, p. 348). In this case, the degree of freedom is 3.

The hypothesis test is conduct as following:

H_0: $\beta_4 - \beta_7 = 0, \beta_5 - \beta_8 = 0, \beta_6 - \beta_9 = 0$

H_1: null hypothesis is not true

According to Table 6.4, the significance level equals 0.23867, which is greater than the alpha of 0.05 (5% significance level).

Therefore, we fail to reject the null hypothesis and conclude that consumers do not appear to perceive bison fat differently from beef fat. As a result, bison fat and beef fat are not differentiated in the following estimation.

6.2.4 Dummy-Coded Fat Levels versus Effects-Coded Fat Levels

The independent variables of fat levels in Model 1, and Model 2 are dummy-coded, while the variables of fat in Model 3 are effects-coded. Effects-coded variables have some advantages over dummy-coded variables. Dummy-coding is unable to measure the parameter of base attribute level, and assumes that it equals the grand mean. Effects-coding allows for non-linear effects in the attribute levels as does dummy coding, but it dispenses with the disadvantage of perfectly confounding the base attribute level with the grand mean of the utility function (Hensher et al. 2005).

In this study, PRICE is a continuous variable; NOGMO and TR are dummy-coded variables, as these two attributes have only two levels. To be consistent with other dummy-coded variables in the model, fat levels are dummy-coded rather than effects-coded. Fat levels are effects-coded in Model 3, where EC1, EC2, and EC3 denote the first three fat levels.

In Model 3, the estimated parameters of fat level 1, 2, and 3 (EC1, EC2, and EC3) are insignificant, however β_{EC4} is statistically significant different from zero at the 1% level with a negative sign. This suggests that respondents prefer not to choose high-fat beef or bison steaks. However, there is no evidence which one of the three fat levels is most preferred to the respondents. This conclusion is identical to dummy-coded models (Model 1and Model 2).

The Wald test (Table 6.5) shows that the estimate of fat level 4 is significantly different from zero with a negative sign, where the estimated parameter of EC4, $\beta_{EC4} = - \beta_4 - \beta_5 - \beta_6$.

Model 3 also indicates that respondents' perceptions and preferences are not significantly different for fat level 1, level 2 and level 3. However, consumers have different preference for high fat meat (fat level 4), hence, they do not like high fat meat steaks. Therefore, we conclude that dummy-coded fat variables and effect-coded variables come to the same conclusion.

6.2.5 Summary and Conclusions of Basic Models

The comparison of the four basic models has shown that the results of effects-coded and dummy-coded fat variables are identical. Further, we do not need to distinguish between bison and beef fat in the further estimation and model development. To be consistent with other attribute variables and with socio-economic and demographic variables, which are either continuous variables or dummy variables, the fat levels are dummy-coded in the following estimation. Further modeling and estimation is based on Model 1.

6.3 Incorporating Socio-economic and Demographic Characteristics

Incorporating a respondent's socio-economic and demographic characteristics into the utility function and the model estimation process can investigate respondents' heterogeneous demand and preferences. As explained in chapter 4 (methodology), it is assumed that a respondent chooses a particular meat steak to maximize his or her utility. Utility depends on U_{ij}, which includes individual respondent's characteristics and alterative specific attributes. To distinguish the two groups of variables, let X_{ij} be the matrix of the attributes of meat steak *j* perceived by respondent *i* which varies across the choice and possibly across the individual; let S_i be the vector of the socio-economic and demographic characteristics of individual *i*, which are constant for all the choices made by respondent *i*, so that $U_{ij} = [X_{ij}, S_i]$.

6.3.1 The Impact of Socioeconomic and Demographic Characteristics

Respondents' socio-economic and demographic characteristics are interacted with alternative-specific attributes to capture the impact of demographic and socio-economic characteristics on respondents' perceptions and preferences towards the steak attributes. Further, socio-economic and demographic characteristics are interacted with alternative specific constants (ASCs) to investigate respondents' preferences with regards to each of the three alternatives.

In this study, the socio-economic and demographic variables are interacted with the ASCs of beef and "opt-out". For example, the variable income (INCOME) is interacted with is the ASC of beef (ASC1), denoted as INCOME1, which expresses the effect of income on the probability of choosing beef relative to choosing bison. INCOME is also interacted with the ASC of choosing "neither beef nor bison" (ASC3), denoted as INCOME3. This interaction term expresses the effect of income on the probability of choosing "neither beef nor bison" relative to bison. By similar means, other variables of a respondent's socio-economic and demographic characteristics are interacted with ASC1 and ASC3.

Socio-economic and demographic characteristics are also interacted with alternative-specific attributes. Attributes take on values that are specific to each choice; therefore, even for the same individual, choices may vary when the levels of an attribute change. For example, the variable income (INCOME) is interacted with the attribute traceability (TR), denoted as INCTR, which expresses the effect of income on the probability of having the attribute of traceability label relative to not having the traceability label. In a similar way, other variables of a respondent's socio-economic and demographic characteristics are interacted with other attributes like price (PRICE) and non-GMO labeling (NOGMO).

6.3.2 Testing Interaction Terms

The interactions which were tested for are presented in Model 4, Model 5 and Model 6, which are shown in Table 6.6 and Table 6.7. The joint Wald test suggests that EDU1, EDU3, LOCALE1, LOCALE3, GENDER1, GENDER3, KID1, and KID3 are jointly insignificant; individual *t*-statistics are also statistically insignificant for these variables. These tests indicate that respondents' educational level, gender, their rural or urban roots, and whether they constitute of households with more than one child are all unlikely to influence consumers' decision-making. These variables therefore are not included in further estimation procedures.

However, RED1, RED3, EX1, EX3, INCOME1, INCOME3, AGE1, AGE3, MARRIED1, MARRIED3, SMOKE1, SMOKE3 are jointly significant according to the Wald test. This suggests red meat preference, health consciousness, income, age, marital status, and willingness to take health risk may be important factors to influence respondents' choices. These variables will be included in the model development below. Socioeconomic and demographic characteristics were also interacted with alternative-specific attributes. The Wald test suggests that EDGMO, EDTR, INCGMO, INCTR, AGEGMO, AGETR, LOCGMO, LOCTR, GENGMO, GENTR, EXGMO, EXTR, SMOKEGMO, SMOKETR, MARGMO, MARTR, KIDGMO, and KIDTR are jointly significant when they are incorporated into the basic model. However, the *t* statistics suggest that the parameter estimates of EDTR, INCTR, AGEGMO, AGETR, LOCGMO, GENTR, EXGMO, EXTR, SMOKEGMO, MARGMO, MARTR, and KIDGMO are not significantly different from zero.

6.4 The Final Empirical Models

6.4.1 Goodness of Fit

Table 6.8 shows three models from which the final model is selected. These three models include both interactions between socioeconomic and demographic variables and ASCs, and interactions between socioeconomic and demographic variables and alternative-specific attributes. The results of the three models are shown in Tables 6.9.

Log-likelihood Ratio tests were performed between Model 7 and Model 8, and between Model 8 and Model 9, in order to reveal the implications of imposing constrains on those models. The test statistics suggest that Model 7 and Model 8 are to be preferred at 5% level. The value of McFadden's *pseudo*-R^2 in Model 6 is greatest among the three models, which suggests that Model 8 has the best fit of the three models. Joint Wald tests indicate that LOCGMO, LOCTR, INCGMO, and INCTR are not jointly significant in Model 1, but ORGANIC1, ORGANIC3, ORGANGMO, ORGANTR, INCGMO, and INCTR are jointly significant in Model 6. Taking all of the above tests into account, we conclude that Model 8 is the most preferred model in this study. Therefore, the following interpretation of the empirical results will be focused on Model 8.

6.4.2 Alternative Specific Constants

The alternative specific constant (ASC) ALT1 is statistically significant different from zero at the 1% level with positive sign, which suggests that there is a significant number of unobserved sources of utility associated with beef. The ASC of the third choice, ALT3 has negative sign, but is not statistically significant from zero. The parameter estimates of ALT1 and ALT3 suggest that beef is most preferred by respondents in the choice experiments, and that there are more unobserved sources of utility associated with beef and the opt-out option as compared to bison, holding all observed factors constant.

6.4.3 Price

The estimated parameter of price (PRICE) is statistically significant at 1% level with negative sign, indicating that as the price of an alternative increases, a respondent's utility will decrease. In particular, people who have at least one child are more likely to be affected by price increases, since the estimated coefficient of KIDP is negative and significant at the 10% level.

6.4.4 Non-GMO

Non-GMO labeling (NOGMO) is statistically significant at 1% level with positive sign, which implies that consumers are more likely to choose meat steaks that are certified produced without genetically modified organisms. However, the interaction term EDGMO is significant at the 1% level with negative sign, which suggest that higher educated people are less likely to choose meat steaks with Non-GMO labeling, since the attribute of Non-GMO labeling actually decreases their utility.

Respondents who have more than one child in their household may not be interested in non-GMO labeling, as the coefficient of KIDGMO is negative, yet not significantly different from zero. INCGMO is significant at 5% in Model 6 with a positive sign, which indicates that higher income consumers are more likely to choose steaks that are labeled as produced without GMOs.

The estimated parameter of ORGANGMO is statistically significant at the 5% level, and the sign is positive. Organic food buyers' utilities are higher when they buy meat cuts with non-GMO labels; the sign is expected, since organic food supporters are usually opposed to genetically modified or genetically engineered biotechnologies (Hallman et al. 2003).

6.4.5 Farm Origin Traceability

The estimated parameter of traceability (TR) is negative and statistically significant at the 5% level, which suggests that consumers are less likely to choose a meat steak with a guarantee of traceability; negative sign indicates that this attribute will decrease a consumer's utility.

However, more educated people do care about traceability label at 10% level, which indicates that they have higher concern with food safety issues. Respondents who have at least one child in their household are also more likely to buy meat steaks with traceability labeling, as the coefficient of KIDTR is positively significant at 1% level. The variable income (INCOME) is interacted with is the attribute traceability (TR), denoted as INCTR, which expresses the effect of income on the probability of choosing a bison steak with farm origin traceability labeling. However, the insignificance of this interaction term suggests that assurance of farm origin traceability does not affect the choice probabilities of high income consumers differently from those of lower income consumers.

The sign of ORGANTR is positive, but the estimated coefficient is not significantly different from zero, which implies that organic food buyers are indifferent with regards to traceability labeling. The findings for traceability suggest that consumers with varying socio-economic characteristics perceive the importance of traceability differently, which is consistent with the research of traceability for beef and pork (Hobbs et al. 2005). Hobbs et al. (2005) conclude that age, gender, education, and income are not significant, and also argue that traceability assurance is limited to elicit consumers' willingness to pay. However, the authors suggest that bundling traceability with quality assurances will deliver more value to Canadian consumers.

6.4.6 Fat

Consistent with the results of basic models, people prefer to buy low or medium fat meat cuts, or meat cuts with trimmable fat; high fat meat cuts are likely to decrease a consumer's utility significantly. The parameter estimates for trimmable fat (FAT1), low fat (FAT2), and medium fat (FAT3) are all statistically significant, and the signs are all positive. However, respondents' preferences among trimmable fat, 1-5% fat and 5-15% fat are heterogeneous: the size of the estimated parameters of FAT1, FAT2, and FAT3 are statistically significant, but the difference among trimmable fat, low-fat (1-5% fat) and medium-fat levels (5-15% fat) are relatively small. It is therefore difficult to make a conclusive statement which level of fat meat cut is the most preferred one. This is maybe because consumers perceive meat fat different due to taste differences. Some consumers may prefer to buy meat cuts with trimmable fat, which they can cut off at home; some consumers may choose low fat meat cuts, and there may be consumers who prefer more fat due to their taste preference. Hobbs et al. (2006) find that the low fat attribute of bison alone is insignificant to capture consumers' willingness to pay, which is similar to the findings about fat attribute in this study.

6.4.7 Socioeconomic and Demographic Variables interacted with ASCs

Respondents who prefer red meat are more likely to choose beef or bison, and less likely to choose "opt-out", as the coefficients of RED1 and RED3 indicate. Respondents who exercise regularly are more attracted by bison meat, which suggests that bison meat is particularly attractive to more health conscious consumers. The results also suggest that higher income consumers are less likely to opt-out at the 10% level, and they prefer beef or bison. However, they do not significantly prefer beef to bison, according to the *t* statistics and *p*-values. Considering the coefficient estimate of the squared age variable, a U-shaped quadratic function of age with respect to beef is implied. This indicates that a consumer at younger age is more likely to choose beef, however, as consumers are more middle-aged, they are less likely to choose beef, but more likely to switch to bison. But as consumers become older again, they are more likely to choose beef than bison. Previous literature also finds a significant relationship between the choice of alternative meats and age, Nelson and Liu (2005) conclude that goat meat consumers are primarily of middle age and the elder, while young consumers are less likely to consume goat meat. The empirical results also suggest that organic food buyers' preference for bison meat is unknown, as the estimated parameters of ORGANIC1 and ORGANIC3 are not significantly different from zero.

6.5 Marginal Effects

In a MNL / CL model, the interpretation the random utility function on the probabilities will be enhanced if an independent variable's marginal effects to choice probabilities are also interpreted due to the nonlinearity of the probability function. Marginal effects reflect the rate of change in one variable relative to the rate of change in another variable, which are expressed as unit changes. In a MNL / CL model, marginal effect is interpreted as the change in choice probability given a unit change in an independent variable, ceteris paribus (Kennedy, 2003; Hensher et al., 2005).

Given Probability (Y = *j*) = P$_j$, and if the independent variable x_i is a continuous variable, the marginal effect of x_i on the probability of choosing alternative *j* can be expressed as:

$$\frac{\partial P_j}{\partial x_i} = P_j \beta_{ij} - P_j \sum_{k=1}^{K} P_k \beta_{ik} \qquad (6.1)$$

where *j* = 1, 2, 3, β_{ij} is the coefficient of x_i of the *j*-th choice. The marginal effect of a dummy variable on the probability of Y = *j* is

$$P_j \mid x_k = P_j(x_k = 1) - P_j(x_k = 0) \qquad (6.2)$$

Table 6.10 resents the marginal effects resulting from the changes of price, farm origin labeling, non-GMO labeling and fat contents respectively which are calculated based on Model 1. It is assumed that a typical bison steak costs $22.99 per kilogram (in Canadian dollar) with the certified label of non-GMO feed; it is very lean with only 1% to 5% fat (FAT2), however there is no certified label of farm origin traceability on the package. Similar, a typical beef steak is assumed to be $15.99 per kilogram without the certified label of non-GMO feed and the certified label of farm origin traceability; the beef steak is a meat cut with trimmable fat (FAT1).

Given the levels of four attributes for bison steak and beef steak, the probability of choosing bison is 23.3%, and the probability of choosing beef is 69.1%; there is about 7.6% of chance that a respondent will choose neither to buy beef nor bison.

Holding other factors constant, if the price of bison increases by 1 dollar, the probability of choosing bison will decrease by 1.3%; if the bison steak has the certification of farm origin traceability, the probability of choosing bison will increase by 1.8%, ceteris paribus; however, without the certified label of non-GMO on the package, the probability of choosing bison will decrease by 6.1%, given the levels of other variables unchanged; if the bison steak is a meat cut with trimmable fat, the chance of choosing bison will increase by 1.5%; if the bison steak is a meat cut that contains 5% to 15% fat content, the probability of choosing it will increase by 1.7%, ceteris paribus.

If the price of beef steak increases by 1 dollar, the probability of choosing beef will decrease by 1.6%, ceteris paribus; if the beef steak has the certified label of farm origin traceability, the probability of choosing bison will increase by 2.0%, holding other factors fixed; also, with the certified label of non-GMO on the package, the probability of choosing beef will increase by 7.5%, given other variables constant; if the beef steak is very lean and low in fat (1% to 5% fat content), the chance of choosing beef will decrease by 1.8%; if the beef steak is a meat cut that contains 5% to 15% fat content, the probability of choosing it will increase by 0.2%, ceteris paribus.

6.6 Willingness-to-Pay (WTP)

Willingness-to-Pay (WTP) is designed to provide a monetary measure that shows how much individuals are willing to forfeit in order to obtain some benefit from a specific attribute or task (Hensher et al. 2005). In simple linear models, WTP measures are calculated as the ratio of two parameter estimates, ceteris paribus. Therefore, the marginal rates of substitution or the ratio of two utility parameters will provide a financial indicator of WTP, as long as at least one attribute is measured in monetary units (Louviere et al. 2000; Hensher et al. 2005). Haab and McConnell (2002) suggest that the WTP for the linear utility function model depends on the random error and an m-dimensional vector of covariates, z, such that $WTP_j = z_j \cdot \alpha / \beta + e_j / \beta$, where β is the parameter of the attribute measured in monetary units, price or cost.

Let MU denotes the marginal utility of an attribute, then

$$MU_{price} = \frac{\partial U_{ij}}{\partial (PRICE)},\ MU_{NOGMO} = \frac{\partial U_{ij}}{\partial (NOGMO)},\ MU_{Traceability} = \frac{\partial U_{ij}}{\partial (Traceability)},$$

$$MU_{FAT1} = \frac{\partial U_{ij}}{\partial (FAT1)},\ MU_{FAT2} = \frac{\partial U_{ij}}{\partial (FAT2)},\ MU_{FAT3} = \frac{\partial U_{ij}}{\partial (FAT3)};$$

therefore,

$$WTP_{NOGMO} = -\frac{MU_{NOGMO}}{MU_{price}},\ WTP_{Traceability} = -\frac{MU_{Traceability}}{MU_{price}},$$

$$WTP_{FAT1} = -\frac{MU_{FAT1}}{MU_{price}},\ WTP_{FAT2} = -\frac{MU_{FAT2}}{MU_{price}},\ WTP_{FAT3} = -\frac{MU_{FAT3}}{MU_{price}}$$

In this study, the attribute measured in monetary units is the price of a meat steak (PRICE). Based on the coefficient estimates of Model 8, the first step is to calculate each individual's marginal utilities of Non-GMO labeling, traceability labeling and fat with respect to price; the second step is to calculate the individual's WTPs for NOGMO, TR, FAT1, FAT2, and FAT3; finally, the mean and median of the WTPs for non-GMO labeling, traceability and fat are calculated based on the results of previous two steps. They are provided in Table 6.11.

The statistics show that respondents' WTP for each attribute is positive, which suggests that respondents are willing to pay a price premium for the attributes. The mean and median WTP for Non-GMO labeling (NOGMO) are \$6.28 and \$3.97 respectively, which indicate the potential premium that bison meat producer can charge; the mean and median WTP for traceability labeling (TR) are \$0.39 and \$1.19 respectively, so that the price premium for traceability is around \$0.39 or \$1.19. The range of WTP for both NOGMO and TR are relative large, which may suggest that respondents' preferences for these labeling attributes are quite different. The WTP for the three fat levels are very high, however, the values may indicate that respondents are willing to pay a price premium for lower fat meat cuts, but strongly dislike high fat steaks.

6.7 Chapter Summary

This chapter has provided the estimation results, based on the data from the choice experiment. The process of model development was discussed, and a final model was presented, from which we have derived marginal effects and willingness-to-pay estimates and implications for bison marketing.

Summary of Estimation and Results

Table 6.1 Attributes and Levels

Attributes	Levels
Beef Price	\$13.99/kg, \$15.99/kg, \$22.99/kg, \$28.99/kg
Bison Price	\$12.99/kg, \$22.99/kg, \$32.99/kg, \$42.99kg
Beef Fat	trimmable, 1-5% visible (not trimmable), 5-15%visible (not trimmable), 15-50% (not trimmable)
Bison Fat	trimmable, 1-5% visible (not trimmable), 5-15% visible (not trimmable), 15-20% visible (not trimmable)
Traceability	yes, no
Non-GMO	yes, no

Table 6.2.1 Description of Variables

Variables	Description	Expected Sign
ALT1	alternative specific constant of beef (choice 1)	+/-
ALT2	alternative specific constant of bison (choice 2)	+/-
ALT3	alternative specific constant of neither beef nor bison (choice 3)	+/-
PRICE	Price (in Canadian Dollars)/kg of the meat steak	-
TR	label of traceability, 1 = yes, 0 = no	+
NOGMO	label of no Genetically Modified Organisms,1 = yes, 0 = no	+
FAT1	dummy-coded fat level 1, trimmable	+
FAT2	dummy-coded fat level 2, 1-5% visible (not trimmable)	+
FAT3	dummy-coded fat level 3, 5-15%visible (not trimmable)	+/-
FAT4	dummy-coded fat level 4, 15-50% or 15-20% (not trimmable)	-
FA1	dummy-coded beef fat level 1, trimmable	+
FA2	dummy-coded beef fat level 2, 1-5% visible (not trimmable)	+
FA3	dummy-coded beef fat level 3, 5-15%visible (not trimmable)	+/-
FA4	dummy-coded beef fat level 4, 15-50% visible (not trimmable)	-
FB1	dummy-coded bison fat level 1, trimmable	+
FB2	dummy-coded bison fat level 2, 1-5% visible (not trimmable)	+
FB3	dummy-coded bison fat level 3, 5-15%visible (not trimmable)	+/-
FB4	dummy-coded bison fat level 4, 15-20% (not trimmable)	-
EC1	effects-coded fat level 1, trimmable	+
EC2	effects-coded fat level 2, 1-5% visible (not trimmable)	+
EC3	effects-coded fat level 3, 5-15%visible (not trimmable)	+

Table 6.2.1 (continued)

Variables	Description	Expected Sign
EC4	effects-coded fat level 4, 15-50% or 15-20% (not trimmable)	-
EDU	education if university or grad school = 1, otherwise = 0	n.a.
INCOME	mean points of the income categories	n.a.
AGE	mean points of the age categories	n.a.
EX	exercise regularly = 1 otherwise = 0	n.a.
RED	consumers who prefer red meat than white meat = 1 otherwise=0	n.a.
LOCALE	rural = 1, urban = 0	n.a.
GENDER	male = 1, female = 0	n.a.
MARRIED	married = 1, otherwise = 0	n.a.
SMOKE	smoker = 1, non-smoker = 0	n.a.
KID	have at least one child = 1, otherwise = 0	n.a.
ORGANIC	organic food buyers = 1, otherwise = 0	n.a.
EDGMO	EDU × NOGMO	+
EDTR	EDU × TR	+
KIDGMO	KID × NOGMO	+
KIDTR	KID × TR	+
KIDP	KID × PRICE	-
LOCGMO	LOCALE × NOGMO	+/-
LOCTR	LOCALE × TR	+/-
INCGMO	INCOME × NOGMO	+
INCTR	INCOME × TR	-
ORGANGMO	ORGANIC × NOGMO	-
ORGANTR	ORGANIC × TR	+/-
AGE1	AGE × ALT1	+/-
$AGE1^2$	AGE^2 × ALT1	+/-
AGE3	AGE × ALT3	+/-
$AGE3^2$	AGE^2 × ALT3	+/-
EX1	EX × ALT1	-
EX2	EX × ALT2	+
EX3	EX × ALT3	-

Table 6.2.2 Summary Statistics for Demographic Variables

	Mean	Std.Dev.	Minimum	Maximum	N
GENDER	0.4709	0.4993	0	1	206
LOCALE	0.4000	0.4900	0	1	205
SMOKE	0.2621	0.4399	0	1	206
EX	0.5534	0.4972	0	1	206
MARRIED	0.5663	0.4957	0	1	196
EDU	0.2714	0.4448	0	1	210
INCOME	56832.80	28193.70	0	100,000	210
AGE	40.8952	14.6760	0	85	210
KID	0.4048	0.4909	0	1	210
ORGANIC	0.3000	0.4583	0	1	210

Table 6.3 Comparison of Basic Models:

Variables	Model 1		Model 2		Model 3	
	Coeff.	t-ratio	Coeff.	t-ratio	Coeff.	t-ratio
ALT1	0.861***	6.6548	1.617***	3.1369	0.860***	6.6548
ALT3	-1.848***	-5.5965	-1.699***	-4.7989	-2.355***	-8.6783
PRICE	-0.076***	-8.1978	-0.077***	-8.2458	-0.076***	-8.1978
TR	0.098	0.6658	0.089	0.5933	0.098	0.6658
NOGMO	0.382**	2.5425	0.400***	2.5901	0.382**	2.5425
FAT1	0.700***	2.8589				
FAT2	0.618**	2.5478				
FAT3	0.710***	2.7688				
FAT4						
FA1			0.095	0.1998		
FA2			-0.049	-0.1040		
FA3			0.258	0.5216		
FB1			0.934***	2.9807		
FB2			0.961***	3.0645		
FB3			0.777**	2.4262		
EC1					0.193*	1.7745
EC2					0.111	1.0323
EC3					0.203	1.6319
EC4					-0.507***	-2.9700

*, **, and *** are significant at 10%, 5% and 1% level respectively

Table 6.4 Wald Test for Beef Fat vs. Bison Fat

Wald Statistic(χ^2 [3]) = 4.22000
Significance Level = 0.23867

Function	Parameter	Std. Er.	t-ratio	*p*-value
$\beta_4 - \beta_7$	-0.839	0.571	-1.470	0.142
$\beta_5 - \beta_8$	-1.010	0.568	-1.779	0.075
$\beta_6 - \beta_9$	-0.519	0.581	-0.894	0.371

Table 6.5 Wald Test for Effects-Coded Fat Level 4

Wald Statistic(χ^2 [3]) = 8.82253
Significance Level = 0.00298

Function	Parameter	Std.Er.	t-ratio	*p*-value
β_{EC4}	-0.507	0.171	-2.970	0 .0030

Table 6.6 Comparison of Model 4, Model 5, and Model 6

	Model 4	Model 5	Model 6
Log Likelihood Function	-465.675	-473.010	-490.164
***pseudo*-R^2**	0.184	0.177	0.141
Number of Restrictions	8.000	14.000	15.000
Chi – Squared (χ^2-statistic)	9.140	67.760	28.460
Significance Level	0.331	0.000	0.019

Table 6.7 Results of Model 4, Model 5 and Model 6

	Model 4			Model 5			Model 6	
	Coeff.	*p*-value		Coeff.	*p*-value		Coeff.	*p*-value
ALT1	3.456	0.002	ALT1	3.882	0.000	ALT1	0.920	0.000
ALT3	-0.494	0.776	ALT3	-0.759	0.649	ALT3	-1.702	0.000
PRICE	-0.093	0.000	PRICE	-0.094	0.000	PRICE	-0.089	0.000
TR	0.208	0.207	TR	0.242	0.136	TR	-0.254	0.771
NOGMO	0.592	0.001	NOGMO	0.599	0.000	NOGMO	2.163	0.015
FAT1	1.133	0.000	FAT1	1.088	0.000	FAT1	0.926	0.001
FAT2	0.904	0.001	FAT2	0.850	0.002	FAT2	0.895	0.001
FAT3	0.983	0.001	FAT3	0.981	0.001	FAT3	0.938	0.001
RED1	0.347	0.184	RED1	0.319	0.214	EDGMO	-0.737	0.000
RED3	-1.178	0.002	RED3	-1.242	0.001	EDTR	0.084	0.649
EX1	-0.487	0.038	EX1	-0.476	0.037	INCGMO	0.000	0.063
EX3	-0.989	0.004	EX3	-1.055	0.002	INCTR	0.000	0.929
INCOME1	0.000	0.831	INCOME1	0.000	0.850	AGEGMO	0.005	0.715
INCOME3	0.000	0.072	INCOME3	0.000	0.025	AGETR	0.005	0.728
AGE1	-0.141	0.006	AGE1	-0.153	0.002	LOCGMO	0.180	0.601
AGE1^2	0.001	0.012	AGE1^2	0.002	0.004	LOCTR	-0.719	0.036
AGE3	-0.009	0.914	AGE3	0.012	0.871	GENGMO	-0.539	0.091
AGE3^2	0.000	0.749	AGE3^2	0.000	0.996	GENTR	-0.038	0.906
MARRIED1	0.692	0.011	MARRIED1	0.790	0.002	EXGMO	-0.045	0.889
MARRIED3	0.328	0.422	MARRIED3	0.470	0.221	EXTR	0.453	0.161
SMOKE1	0.533	0.065	SMOKE1	0.474	0.082	SMOKEGMO	-0.253	0.527
SMOKE3	1.441	0.000	SMOKE3	1.479	0.000	SMOKETR	-0.694	0.083
LOCAL1	0.306	0.208				MARGMO	0.032	0.934
LOCAL3	0.118	0.734				MARTR	-0.164	0.660
GENDER1	-0.220	0.338				KIDGMO	-0.191	0.591
GENDER3	-0.214	0.527				KIDTR	0.619	0.065
KID1	0.252	0.309						
KID3	0.415	0.268						
EDU1	0.220	0.393						
EDU3	-0.738	0.123						

Table 6.8 Comparison of Model 7, Model 8 and Model 9

	Model 7	Model 8	Model 9
Log Likelihood Function	-499.445	-497.324	-505.212
Number of Parameters	27.000	29.000	23.000
***pseudo*-R^2**	0.158	0.167	0.154
Number of Restrictions	4.000	6.000	N.A.
Chi - Squared	6.120	15.670	N.A.
Significance Level	0.191	0.016	N.A.

Table 6.9 the Final Empirical Models (Model 7, Model 8 and Model 9)

Variable	Model 7			Model 8			Model 9		
	Coeff.	t-ratio	p-value	Coeff.	t-ratio	p-value	Coeff.	t-ratio	p-value
ALT1	3.3280	3.223	0.001	3.5272	3.288	0.001	3.4995	3.480	0.001
ALT3	-0.8132	-0.531	0.596	-0.8545	-0.549	0.583	-0.6716	-0.446	0.655
PRICE	-0.0729	-6.444	0.000	-0.0747	-6.580	0.000	-0.0753	-6.686	0.000
TR	-0.9458	-1.593	0.111	-1.3262	-2.296	0.022	-1.1323	-2.160	0.031
NOGMO	1.8711	2.966	0.003	1.8261	2.876	0.004	2.3421	4.122	0.000
FAT1	0.9014	3.373	0.001	0.9392	3.514	0.000	0.9320	3.548	0.000
FAT2	0.7267	2.733	0.006	0.7554	2.828	0.005	0.7445	2.852	0.004
FAT3	0.7631	2.702	0.007	0.8005	2.836	0.005	0.7523	2.705	0.007
EDGMO	-0.6494	-3.459	0.001	-0.7301	-3.843	0.000	-0.5719	-3.290	0.001
EDTR	0.2891	1.689	0.091	0.3043	1.783	0.075	0.3132	1.960	0.050
KIDGMO	-0.3048	-0.929	0.353	-0.1416	-0.432	0.666	-0.2202	-0.688	0.492
KIDTR	0.9013	2.821	0.005	0.9330	2.939	0.003	0.8766	2.822	0.005
KIDP	-0.0237	-1.770	0.077	-0.0256	-1.897	0.058	-0.0230	-1.729	0.084
RED1	0.3341	1.348	0.178	0.3781	1.510	0.131	0.3154	1.282	0.200
RED3	-0.9393	-2.733	0.006	-0.9625	-2.797	0.005	-0.9618	-2.800	0.005
EX1	-0.4393	-1.978	0.048	-0.4757	-2.141	0.032	-0.4656	-2.120	0.034
EX3	-1.0452	-3.190	0.001	-1.1121	-3.378	0.001	-1.0362	-3.175	0.002
INCOME1	0.0000	0.879	0.379	0.0000	0.891	0.373	0.0000	0.255	0.799
INCOME3	0.0000	-2.108	0.035	0.0000	-1.861	0.063	0.0000	-3.329	0.001
AGE1	-0.1217	-2.445	0.014	-0.1261	-2.450	0.014	-0.1228	-2.546	0.011
AGE1^{2}	0.0013	2.283	0.022	0.0013	2.220	0.026	0.0013	2.372	0.018
AGE3	0.0364	0.504	0.614	0.0271	0.370	0.712	0.0401	0.566	0.571
AGE3^{2}	-0.0002	-0.234	0.815	-0.0001	-0.092	0.927	-0.0002	-0.288	0.773
LOCGMO	0.4593	1.425	0.154						
LOCTR	-0.5535	-1.710	0.087						
INCGMO	0.0000	1.601	0.109	0.0000	1.971	0.049			
INCTR	0.0000	0.244	0.807	0.0000	0.561	0.575			
ORGANIC1				-0.2118	-0.805	0.421			
ORGANIC3				0.5164	1.273	0.203			
ORGANGMO				0.7538	2.144	0.032			
ORGANTR				0.2142	0.642	0.521			

Table 6.10 Marginal Effects (M. E.)

Variable	Coeff.	Bison	M. E.	Beef	M. E.	Opt-out	M. E.
ALT1	0.8605	0	n.a.	1	n.a.	0	0
ALT3	-1.8476	0	n.a.	0	n.a.	1	0
PRICE	-0.0755	22.99	-0.0132	15.99	-0.0163	0	0
TR	0.0975	0	0.0178	0	0.0204	0	0
NOGMO	0.3821	1	-0.0612	0	0.0752	0	0
FAT1	0.7004	0	0.0150	1	0.0000	0	0
FAT2	0.6183	1	0.0000	0	-0.0178	0	0
FAT3	0.7101	0	0.0168	0	0.0021	0	0
Probability		0.23256		0.69098		0.0765	

Table 6.11 Willingness to Pay for Attributes (in Canadian Dollars)

	Mean	Median	Std.Dev.	Minimum	Maximum	N
WTPNOGMO	6.276	3.967	9.131	-12.243	30.985	2472
WTPTR	0.388	1.190	6.003	-12.525	19.745	2472
WTPFAT1	9.628	12.577	4.860	0.799	12.577	2520
WTPFAT2	7.744	10.116	3.909	0.643	10.116	2520
WTPFAT3	8.206	2.187	4.142	0.681	10.720	2520

Chapter 7: Summary, Conclusion and Marketing Implications

7.1 Introduction

This chapter summarizes the major findings of the study and discusses marketing implications for the bison industry. Several limitations of the study are outlined; recommendations for further analysis are also discussed.

7.2 Summary and Conclusions of the Study

The purpose of this study was to improve our understanding of consumer perceptions towards bison meat. Focus groups and a web-based survey were implemented to study consumers' attitudes and hypothetical purchasing decisions for bison meat. The Survey data were analyzed to evaluate how bison meat attributes and socio-economic and demographic factors would impact Alberta consumers' choices in purchasing bison. Multinomial logit models were developed to estimate the impact of bison meat attributes and socio-economic characteristics on consumers' choice behaviour.

To the best of our knowledge, the existing literature has not investigated consumers' perceptions towards bison or other alternative meats by implementing attribute-based choice experiments. The choice experiments in this study provide unique insights into the relative value of eating experience, health attributes and production methods for bison. The MNL model results suggest that price, fat content, GMO labeling and labeling of farm origin traceability are, under certain circumstances, significant attributes that impact consumers' choices on meat purchasing. Interactions between bison steak attributes and selected socio-economic and demographic variables, and between alternative-specific constants and socio-economic and demographic variables suggest that selected socio-economic and demographics such as income, gender, education level and marital status are not significant in affecting consumers' choices. However, we identified certain consumer segments that perceive attributes such as farm origin traceability and GMO labeling differently. Further, for the meat attributes specified in this study, health conscious consumers were found to be more likely to choose bison than beef.

The results of this study suggest that it is unlikely that bison meat will move from a niche market to a commodity market of mainstream consumers. Bison is considered as a meat for the healthy gourmet; better understanding of consumers' heterogeneous demands should help to increase bison meat consumption and sustain the growth of the bison industry via better targeting of marketing efforts.

7.3 Marketing Implications

To develop a successful marketing strategy, the bison industry needs to evaluate the competitive advantage and disadvantage of its products in the marketplace relative to competitor products, jointly with an analysis of its entire supply chain. It is desirable to develop promotion strategies to assist in differentiating bison from other competing meat products, and to identify specific consumer segments. These strategies also need to focus on the pricing strategy of bison relative to competitor products.

7.3.1 Taste and Flavour

The results from the importance ranking of meat attributes reveal that "taste and flavour" is the most important attribute for bison meat. This fact suggests that first and foremost, a good eating experience assures that consumers continue to purchase bison, whereas a poor cooking or eating experience (especially in restaurants) will discourage consumers from purchasing bison again. Based on this recognition of consumers' expectations, further promotion strategies and quality assurance schemes can be built.

The results suggest that for many consumers, bison is a red meat similar to beef in taste and appearance. However, its lean nature needs special care in cooking, and our results from consumers' valuation of fat levels suggest that many consumers appear not to be aware of this fact. A growing industry such as the bison industry should emphasize the importance of providing consistent meat quality and the key importance of developing value-added products. For example, marinating techniques to enhance tenderness, and ready-to-cook products will enhance the consumer's eating experience without requiring extensive knowledge of how to cook bison.

7.3.2 Marketing Channels

The descriptive statistics indicate that the bison industry has successfully promoted and defined the bison meat using the term "alternative meat", as over seventy-six percent of respondents perceive bison meat as a type of alternative meat. On the other hand, over fifty percent of people also agree that bison is a wild meat, suggesting that consumers may have different perceptions of bison from those of beef, chicken or other traditional meats. This finding provides the bison industry with opportunities to differentiate bison meat from traditional red meats. However, it is also an indication that consumers' misperceptions are likely to impact bison consumption negatively: those consumers who perceive bison as "wild" are likely to associate "wild" with "endangered species".

As dining-out becomes more popular, it is recommended to market bison meat in high-end restaurants as a "gourmet meat"; good eating experience will positively influence consumers' willingness to purchase bison. Clearly, a consistently positive eating experience can only be assured if current supply side challenges (inconsistent supply) can be overcome. Further, in our study, consumers indicated that the lack of availability is the primary reason that they do not purchase more bison meat. Therefore, our results suggest that in order to ensure sustained industry growth, the bison industry needs to make more efforts to distribute bison meat at the retail level, possibly at higher end retailers such as Save-on-Foods. This proposition is supported by the findings from a related study; as expected, Hobbs et al. (2003) find that consumers are more likely to purchase bison if the meat is available in stores in which they frequently shop. However, our results also suggest that making bison meat more accessible to organic consumers may not be as desirable, as making it more accessible to conventional consumers.

Currently, bison and other alternative meats are most frequently found in specialty food stores such as organic food stores, or else at farmers markets. However, our results suggest that frequent organic food buyers are not willing to purchase more bison meat than other consumer groups. As a result, it appears that the bison industry's marketing efforts may be best geared towards retail outlets that cater to conventional health and quality-conscious consumers, which may occasionally purchase organic foods (e.g. Save-on-Foods).

Since the bison industry is still an emerging industry, it has limited resources available to develop efficient distribution channels and launch promotion campaigns by itself. Given the above challenges of making bison meat more accessible, it is worthwhile for bison producers to consider establishing strategic alliances with retail chains and other elements in the value chain.

7.3.3 GMO Labeling and Farm Origin Traceability

Bison meat is often marketed as produced "naturally", due to the absence of growth hormones in the production process. The results of our study suggest that labeling bison steaks as produced without genetically modified organisms (GMOs) increases the bison steak values significantly. However, whether this negative labeling is to be recommended in practice, depends on the ability of the supply chain members to ensure that only minimum traces of genetically modified organisms are contained in the meat. Although high price premiums were found, it is likely that significant cost of certification and testing has to be incurred for individual producers or marketers to use this type of labeling that refers to "produced naturally" or "produced with natural ingredients".

Producers who operate jointly through larger value chains or cooperatives are more likely to be able to share the financial burden of testing and certification for GMO-free bison meat products, hence may in the future be able to benefit from the price premiums that our study has revealed for labeling "produced without GMOs".

Our results also suggest that labeling bison steaks as produced with a guarantee of farm origin traceability does not increase the value of bison steaks significantly; the results reveal that consumers are unwilling to pay a price premium for farm origin traceability certification. Since certification and the associated testing are costly, it is unlikely that this labeling scheme would pay off for industry participants in the form of a generic marketing effort. However, our findings indicate that marketing this attribute to specific market segments may be worthwhile; higher educated consumers and households with more than one child were found to be more likely to choose bison steaks that give a guarantee for farm origin traceability. This finding suggests that if the farm origin labeling scheme was put into practice, it should be marketed primarily to families with children. It would be difficult in practice to differentiate marketing efforts between high and low educated consumers, so that it cannot be recommended to use farm origin traceability as part of a generic marketing effort.

7.3.4. Other Variables for Market Segmentation

The results suggest that marketing strategies should also focus on the health-related aspects of bison, as health-conscious consumers were found to be more likely to purchase bison meat than other consumer segments. Health-conscious consumers appear to value bison for its lower fat content and the natural production methods (non-GMOs): middle aged consumers and those who exercise regularly are more likely to choose bison steaks with those attributes.

Further, some socio-economic and demographic variables, such as income, gender, education level and marital status, were not found to affect consumers' choice decisions significantly.

7.4 Study Limitations and Recommendations for Further Marketing Research

This study uses a stated preference approach by asking respondents for their hypothetical choices in purchasing steaks, based on steak attributes. A potential limitation is, therefore, a hypothetical response bias, since consumers may not act as predicted in real market situations (Menkhaus 2001).

Further, the research design was limited by describing bison steaks only in terms of four attributes. Although the incompleteness of attributes has a less negative impact on the accuracy of results for choice experiments as compared to other conjoint rating and ranking methods (Louviere et al. 2000), future research should focus on additional bison meat attributes to explore the valuation of other information sources and meat attributes.

Further, the survey sample of this study was limited to Alberta consumers. Although we accounted specifically for urban and rural consumers, the time and expense of conducting the research precluded the use of a larger sample. Further research would be required to identify and evaluate regional differences in preferences, using a larger sample and in more locations. This may be worthwhile, since Hobbs et al. (2003 and 2006) have found potential regional differences in preferences towards bison.

Finally, it was through the focus groups that the importance of labeling the use of GMO in animal feed, and the role of farm origin traceability was revealed. The key findings of the main survey that accessibility is the primary reason for consumers not to purchase more bison meat, together with the focus group discussions, suggest that more research and practical efforts should be targeted towards supply-side issues. Only cohesive efforts at both the demand and supply side are likely to lead to sustainable industry growth, in which all producers can benefit. Moving towards value chains, in which signals from both the demand and supply side are exchanged more effectively, may be one avenue to success.

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Appendix: Survey Questionnaire

1. To what extent do you agree or disagree with the following statements:

	Strongly agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
"Bison is a wild meat"					
"Bison is an alternative meat"					
"Bison is an exotic meat"					

2. To what extent do you agree or disagree with the following statements:

	Strongly agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
"Venison is a wild meat"					
"Venison is an alternative meat"					
"Venison is an exotic meat"					

3. Please evaluate the following features for bison meat, in terms of how important the features are to you personally when you buy this meat (note: buffalo and bison are the same North American species). If you have not bought or eaten bison meat before, please indicate what features would be important to

Product Feature	Extremely Important	Very Important	Somewhat Important	Not Very Important	Not at all Important	Don't know
Tenderness and flavour						
Raised locally						
No use of growth hormones, antibiotics, animal protein in raising the animals						
Trace-back certification on						

packaging (origin)
Seasoned & Ready-to-Cook meat
Handling and cooking recommendations on packaging
Price
Absence of genetic modification (non-GM)
Trying something different
Low Cholesterol and fat
Meat colour

4. What are the five main reasons for you to not purchase bison meat? Please indicate how important those reasons are to you by ranking your reasons (please allocate a number: 1 most important, 5 least important):

	Rank
Lack of promotion and advertising	
Lack of availability	
Lack of cooking/ preparation experience	
In-store packaging unappealing	
Disease-related issues	

5. On average, how many cooked meals do you buy outside of your home per week?

___ 5 or more meals on average per week
___ 2 to 4 meals on average per week
___ Less than 2 meals on average per week

6. How frequently have you consumed certified organic produce (fruit, vegetables or meat) over the past four weeks, whether at home or outside your home?

None	
Once or twice	
3 to 5 times	
Over 5 times	
Don't know/unsure	

7. On average, how many times per week do you eat meals cooked in your home (including meals taken from home to work)?

___. Never

___# of times per week

8. Please describe how meals are prepared at your home by allocating percentage figures across the following three categories (e.g. A: 20%, B: 30%, C: 50%, such that A+B+C = 100%):

A: ___ Meals are **cooked from scratch** using food basics like meat, potatoes, pasta, vegetables, and/or fruit

B: ___ Meals are made using **prepared foods** like frozen dinners, food items cooked at stores or delis, canned soups or pasta

C: ___ Meals are made using a **mixture** of items cooked from scratch and pre-prepared food hems

9. How often have you eaten the following meats in a sit-down restaurant over the past six months?

	Bison	Lamb	Venison	Beef	Chicken	Fish
None						
Once or twice						
3 to 5 times						
Over 5 times						

10. For which of the following events have you purchased the following meats to eat at home? (please select all that apply)

	Bison	**Lamb**	**Venison**
Regular home meal			
Celebration (e.g. Easter)			
Outdoor/BBQ			
Parties at home			

11. How often have you eaten the following meats over the past six months at home? (please select all that apply)

	Bison	Lamb	Venison	Beef	Chicken	Fish
None						
Once or twice						
3 to 5 times						
Over 5 times						

12. Let's say you are in the grocery store where you normally shop. Using the following table of steak features, please characterize your last beef steak purchase. **Each steak feature can be selected at a different level (there are up to four levels for each feature). Please select one box (one level) for each feature:**

Features	**Level of feature**			
Price per kg	☐ $13.99/ kg	☐ $15.99/ kg	☐ $22.99/ kg	☐ $28.99/ kg
Fat	☐ trimmable	☐ 1-5% visible (not trimmable)	☐ 5-15% visible (not trimmable)	☐ 15-50% visible (not trimmable)
Guarantee of farm origin traceability	☐ yes		☐ no	
Guaranteed produced without genetically modified organisms (GMO)	☐ yes		☐ no	

13. to 16.

Assuming that the following steak choices are the only ones available to you, would you be willing to switch to a different steak? The next four questions will consist of forms where the changes will be highlighted from one form to the next.

Product features	Choice A	Choice B	Choice C
	Your last beef steak purchase (as in Question 12)	*Bison steak*	*Neither your last steak nor the Bison steak*
Fat:	*(as selected in Question 12)*	5-15% visible fat (not trimmable)	
Certified label gives guarantee of farm origin traceability:	*(as selected in Question 12)*	Yes	
Certified label states: "Guaranteed produced without genetically modified organisms (GMO)"	*(as selected in Question 12)*	No such label	
Price:	*(as selected in Question 12)*	10% off your *regular* beef steak as selected in Question 14	
I would choose:	☐ Choice A	☐ Choice B	☐ Choice C
If I could no longer buy my *regular beef steak*, I would choose:		☐ Choice B	☐ No purchase

Now envisage your next 10 shopping trips for steaks. Assume that only the above *three* choices are available (Choice A, B and C). Please allocate your 10 steak purchases between these three options, with a number in each case, such that

- **the total of all two choices sums up to 10**
- **you assume that you can only choose from the above two options**

__ times Choice A + __ times Choice B + __ times Choice C = 10

17. Where do you usually get the following meats from? Please select all that apply (you can choose more than one option).

	Direct from the farm	Farmer's market	Super-market	Inde-pendent butcher	Speciality meatshop	Hunt/ fish myself	Acquire from friend/ family	Never buy
Beef								
Chicken								
Fish/ seafood								
Bison								
Lamb								
Venison								

18. If you have bought (or were to buy) bison, how important was (would be) each of the following information sources to you (1 = most important, 5 = least important):

	Extremely Important	Very Important	Somewhat Important	Not Very Important	Not at all Important	Don't know
magazines, newspapers	1	2	3	4	5	6
TV, radio	1	2	3	4	5	6
Internet	1	2	3	4	5	6
Friends, family	1	2	3	4	5	6
Promotional flyers	1	2	3	4	5	6
Health professionals	1	2	3	4	5	6

In-store promotion	1	2	3	4	5	6
Label on package	1	2	3	4	5	6

19. If you have consumed any of the following meats before, please indicate where you first tried it, outside of a sit-down restaurant (including at home and in a fast-food restaurant), or in a sit-down restaurant?

	Bison	**Venison**	**Lamb**
First time tried in sit-down restaurant			
First time tried outside of sit-down restaurant			

20. To what extent do you agree or disagree with the following statement:

"I consider the lack of advertising for bison/venison meat to be a negative signal for quality: I get the impression that the industry has something to hide."

Strongly agree	**Agree**	**Neither Agree nor Disagree**	**Disagree**	**Strongly Disagree**

21. How would you describe your level of attention to the television and radio coverage of any issues related to meat?

I pay

☐ **a lot** of attention to television and radio coverage of meat-related issues.

☐ **moderate** attention to television and radio coverage of meat-related issues.

☐ **little** attention to television and radio coverage of meat-related issues.

22. Please answer some more questions about yourself:

To what extent do you consider yourself to be a red meat or white meat eater? Please allocate percentage figures across the following two categories:

☐% red ☐% white

Would you consider your roots to be: rural? urban?

☐rural ☐urban

Your gender: ☐Male ☐ Female

Your age category:

☐Under 20 ☐20-24 years ☐25-29 years
☐30-39 years

☐40-49 years ☐50-59 years ☐60-69 years
☐70 and over

What is the highest level of education that you have completed? Please check one.

☐Elementary ☐High School ☐College

☐ University ☐Graduate School

Are you a regular smoker? ☐Yes ☐No

Do you exercise regularly? ☐Yes ☐No

What is your ethnic Background?

☐ British Isles
☐ Asian
☐ French
☐ Arab
☐ European
☐ African
☐ Canadian
☐ Other/Not listed

What is your current annual family income from all sources? Please check one.

☐ Less than $24,999 ☐ $25,000-$49,999

☐ $50,000-$69,999 ☐ $70,000-$99,999

☐ More than $100,000

How many years have you lived in Canada?

__ less than 5 years __ 5 – 10 years __ more than 10 years

Are you married? __Yes __No

How many children live in your household?

__1 __2 __3 __4 __5 __more.

How many family members in total live in your household?.

__1 __2 __3 __4 __5 __6 __7 __8 __more.

What locale do you reside in? Please put your postal code